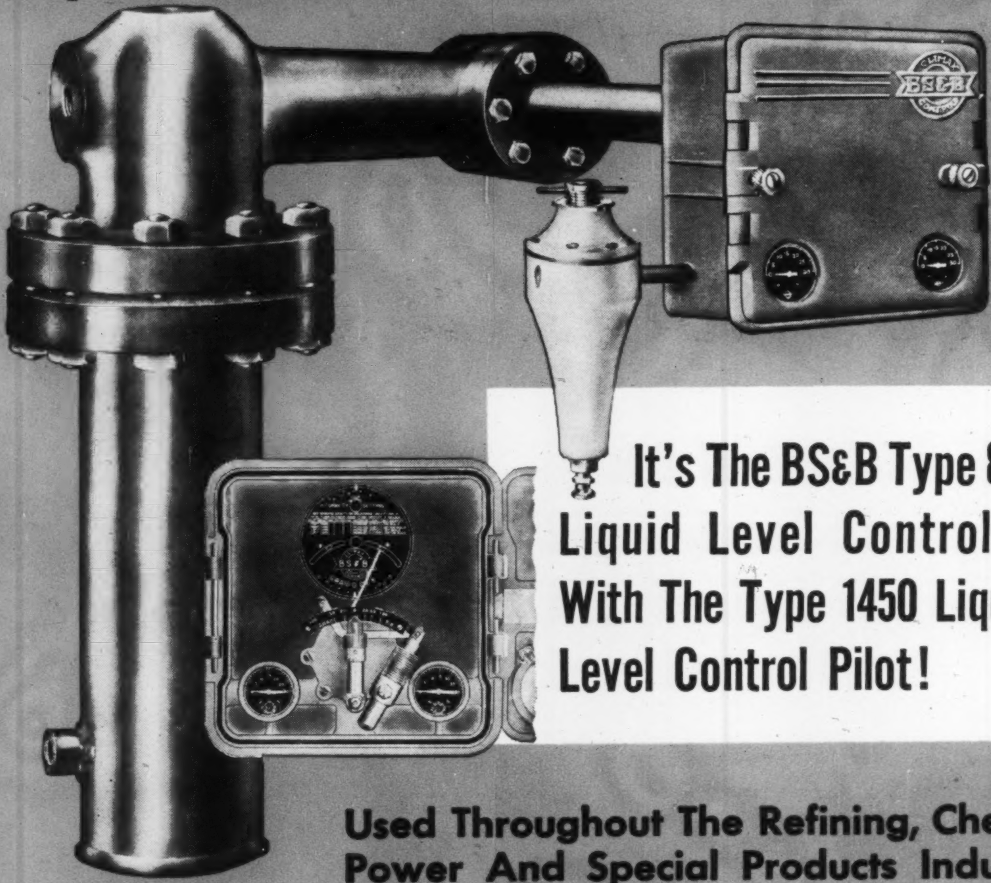
INSTRUMENTS and AUTOMATION

Analytical Balance
+ Differential Transformer
+ Recording Millivoltmeter
= SENSITIVE RECORDING MICROBALANCE
. . . page 1104

Part 1 of two parts
Vol. 28, No. 7
JULY 1955

Including: Simulation Council Newsletter
and The Journal of the SCMA

Here's An Unbeatable Combination For Displacement Type Liquid Level Control!



It's The BS&B Type 888 Liquid Level Controller With The Type 1450 Liquid Level Control Pilot!

Used Throughout The Refining, Chemical, Power And Special Products Industries!

- ✓ Torsion tube assembly eliminates objectionable packing glands and pressure type bearings.
- ✓ Ground Joint Seal.
- ✓ Operates on liquid specific gravities from .2 to 2.0, using standard displacement elements.
- ✓ Control Pilot opens from left or right, as convenient.
- ✓ Calibrated proportional band to 100%.
- ✓ Snap or on-off action may be set at points spread to as much as 75% of the displacement element's range.
- ✓ Specific gravity index is provided for compensating for the various gravities of liquids, or for inter-face gravities.

For Better Regulation of Pressures, Temperatures, Liquid Levels or Flow, Equip Your Process With BS&B AUTOMATIC CONTROLS and SAFETY HEADS!

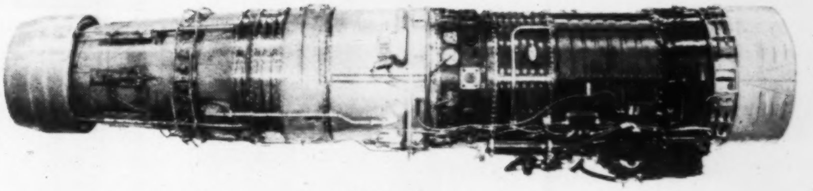
EFFICIENCY
OVER 60 YEARS
BS&B
RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

If You'd Like More Detailed Information, Contact Your Nearest BS&B Representative, Or Write To . . .

BLACK, SIVALLS & BRYSON, INC.
Controls Division, Dept. 4-V7
7500 East 12th Street
Kansas City 26, Missouri

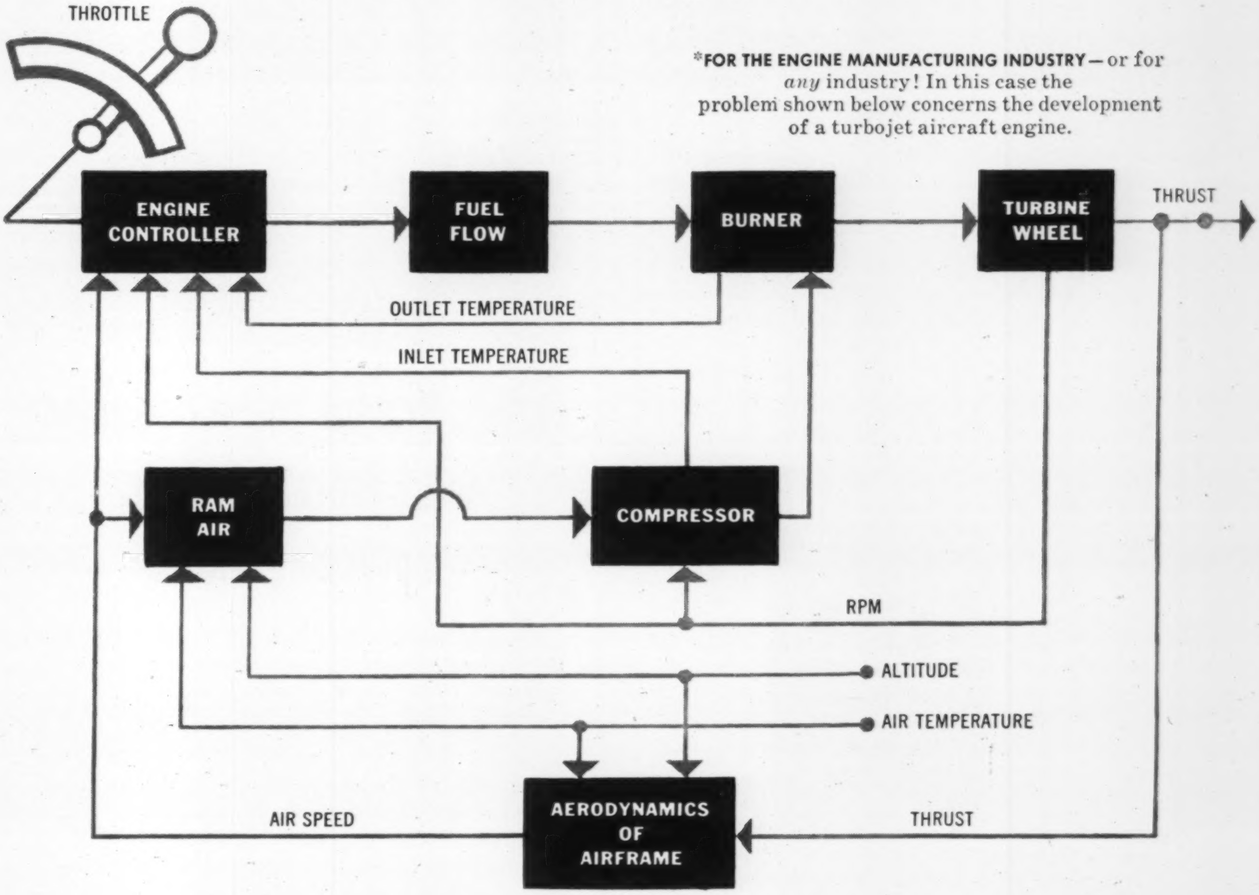
For more information circle 1 on inquiry card.

GEDA



*solves control problems**

*FOR THE ENGINE MANUFACTURING INDUSTRY—or for *any* industry! In this case the problem shown below concerns the development of a turbojet aircraft engine.


THROTTLE
ENGINE CONTROLLER
FUEL FLOW
BURNER
TURBINE WHEEL
THRUST
OUTLET TEMPERATURE
INLET TEMPERATURE
RAM AIR
COMPRESSOR
RPM
ALTITUDE
AIR TEMPERATURE
AIR SPEED
AERODYNAMICS OF AIRFRAME
THRUST

EVEN though you may not be in the aircraft engine business, chances are the problem set-up above may be similar to one facing you right now.

But in any case, *the big point is:*

GEDA—versatile analog computing equipment built by Goodyear Aircraft Corporation—can step-up the analysis and solution of difficult automatic control problems, can eliminate empirical "guesswork" for creative engineers and designers *in ANY industry.*

Once you have programmed your problem on the GEDA problem board, wonderful things begin to happen in a fraction of the time it would take via conventional methods.

The results are given to you in terms of wave forms and voltages—results that are easily translated and require no learning of specialized mathematics.

A MAJOR ENGINEERING ADVANCE the GEDA line of equipment places at your disposal new engineering tools of excellence and accuracy—with quality and flexibility bordering on an engineering revolution. Ask for the facts on GEDA—write:

Goodyear Aircraft Corporation, 931EG,
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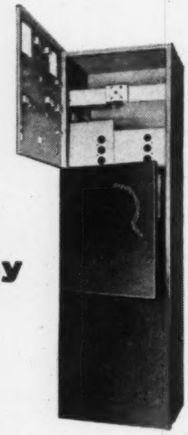
GEDA *ANALOG COMPUTERS—best way to give your hunch a chance!*

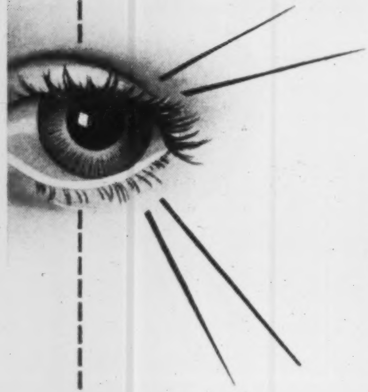
GOODYEAR AIRCRAFT

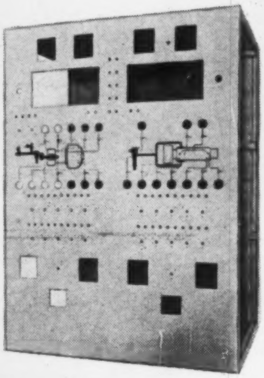
For more information circle **2** on inquiry card.

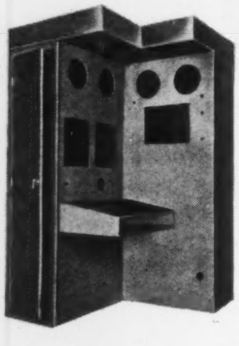
GEDA—T. M. Goodyear Aircraft Corporation, Akron 15, Ohio

FALSTROM
"VISIONEERED"
panels and control boards help improve process efficiency









Falstrom "visioneered" steel instrument and control boards, graphic panels, consoles, cubicles and cabinets are made exactly to your designs and specifications so as to achieve better functional integration of your instruments, for easier supervision with less fatigue. Falstrom fabrications are made to close tolerances and because of Falstrom's large facilities and modern equipment, no need to sacrifice or compromise on your original specifications and intentions.

Falstrom's "visioneered" construction gives you exactly what you envisage. Put Falstrom "visioneering" to work for you in accurate mountings of any size, in any metal—at low cost.

Write for Falstrom catalog of standard panels and control boards 143A or send prints and requirements for prompt estimate.

FALSTROM

FALSTROM COMPANY
92 Falstrom Court • Passaic, New Jersey

For more information circle **3** on inquiry card.

WHAT'S NEW AT BRISTOL...

Now... Bristol thermocouples with metal-ceramic protecting tubes

Bristol's new metal-ceramic LT-1 protecting tubes are the most important advance in thermocouple technology in years.

Combining the thermal conductivity and shock resistance of metal with the corrosion and oxidation resistance of ceramic materials, the new protecting tubes will last far longer than ordinary tubes, give you closer control and faster response.

Here are the advantages of the metal-ceramic LT-1's

- Resistance to combustion gases at temperatures up to 3100°F
- Resistance to oxidation in air at temperatures up to 2200°F
- Retention of strength at high temperatures – 1800 to 2500°F
- Greatly superior to most ceramics in resistance to thermal shock
- Resistance to attack by molten metals and furnace slag
- Increased sensitivity – the 1/8 inch wall has a high thermal conductivity

Get the whole story on Bristol's new tubes. Write for Bulletin P1261 today. The Bristol Company, 113 Bristol Road, Waterbury, Conn.

4.19

BRISTOL

Points the Way in Human-Engineered Instrumentation

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

For more information circle **4** on inquiry card.

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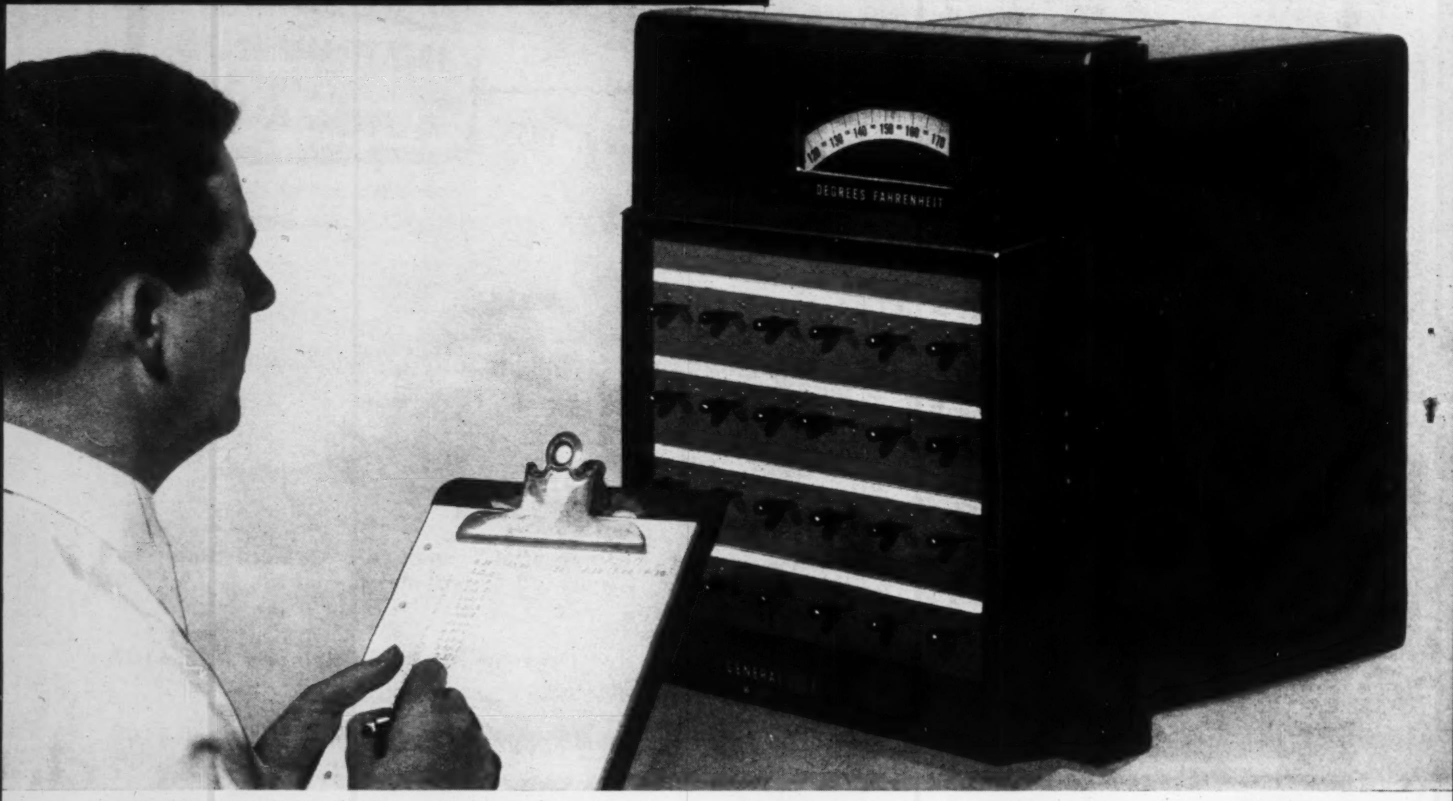
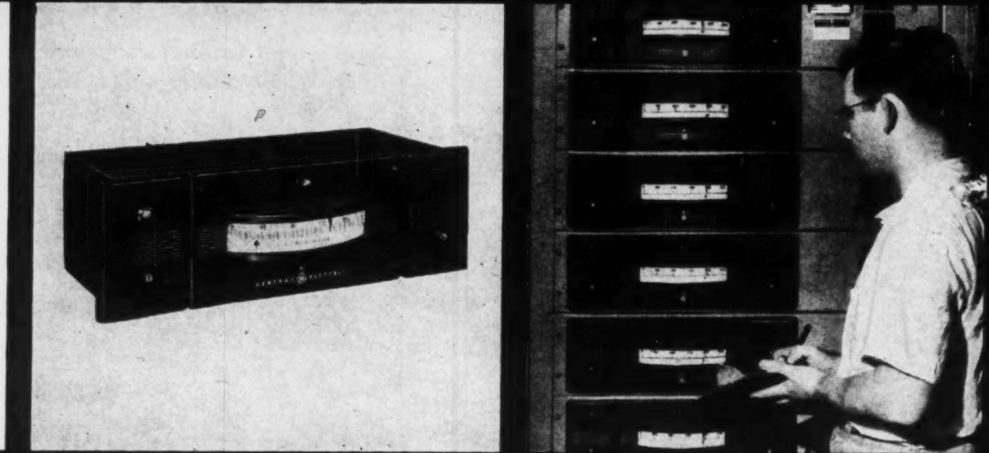
Developments in Process Instruments



G-E PRECISION INDICATOR is available as a single-point or multiple-point instrument. For multi-point instruments different types of switches are available. The toggle type, pictured above, is either locking or non-locking, according to specifications. The push-button type remains in a depressed position until another button is pushed. The large easy-to-read scale supplies quick temperature readings for accurate records and makes logging a simple job for the operator. For further information contact your nearest G-E representative or send in coupon at the right.

USE G-E PYROMETERS FOR ACCURATE CONTROL

General Electric Pyrometers Give Dependable Protection



TYPE HP-3 PYROMETER, a two-position controller, has positive control action, initiated by 0.1 percent in full scale movement of instrument pointer. This gives accurate readings from easy-to-read 7-inch scale. Units are available for flush or surface mounting. Indicator, controller, and protector units are plug-in type, permitting easy servicing.

For more information circle **5** on inquiry card.

New G-E Precision Indicator Makes Temperature Checks Quick and Easy

New G-E Instrument Gives Finger-tip Scanning of up to 48 Process Temperatures in Helping You Maintain Accurate Product Control

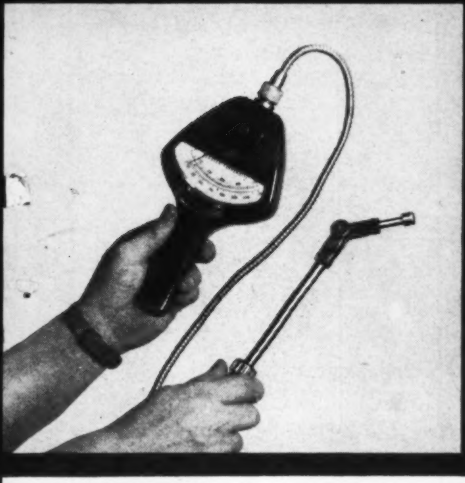
General Electric's new precision indicator scans, by manual switching, from 1 to 48 process temperatures on multi-installations of thermocouples or resistance-bulb circuits. The new G-E potentiometer features a wide temperature range scale and is a high-accuracy, null-balancing instrument.

NEW G-E INDICATOR assures you of having less maintenance by eliminating conventionally used dry cells, slidewire and sliding contacts. This excludes such time-consuming jobs as replacing dry cells, or cleaning moving contacts.

THE MAGNETIC STANDARD provides truly continuous standardization through a revolutionary measurement-circuit design, which incorporates the high stability of a permanent magnet for a reference standard. Loss of measurement and control during standardization periods can never be experienced with constantly balancing G-E system.

G-E RECORDING CONTROLLER has same measurement-circuit design as precision indicator. Long term accuracy and precision of measurement are assured, and you get continuous dependable control with truly continuous standardization.

G-E HAND PYROMETER DESIGNED FOR WIDE USE



GENERAL ELECTRIC COMPANY
SECTION B 587-1
SCHENECTADY 5, NEW YORK

Please send me a copy of the interesting and colorful bulletins checked below:

- ☐ GEA-6020 Hand Pyrometer
- ☐ GEC-713 Thermocouple and Accessories
- ☐ GEC-1311 Type Precision Indicator
- ☐ GED-2100 New Recording Controller

Name..........

Company..........

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City.......... Zone.......... State..........

DUAL-RANGE General Electric hand pyrometer is designed for more flexible and inexpensive measurement of gas, surface and molten-metal temperatures.

EASY-TO-USE hand pyrometer accurately indicates temperature of precision castings. The instrument is light in weight with a non-slip, bayonet-grip handle.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more information circle **5** on inquiry card.

one simple oscillograph . . .

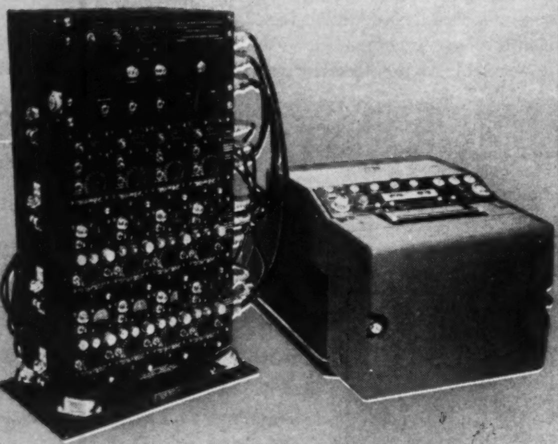
or an entire instrumentation system . . .

Here's the COMPLETE

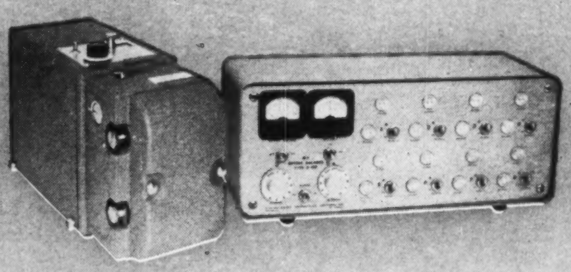
PRICE IS NO CRITERION . . . buy CEC's most economical oscillograph . . . or buy an elaborate *system,* capable of the most complex measurements. Either way, you share in our 18 years of data-processing experience . . . broadest in the field. The same quality that has made CEC the world standard for data recording is found in the least as well as the most expensive instruments.

INTERCHANGEABILITY . . . COMPATIBILITY. These are hallmarks of CEC's entire line. Use the instruments individually, or combine them to meet almost any technical or budget consideration. Whether your problem is as simple as measuring spring deflection on a farm-tractor seat or as critical as recording an atomic blast, think first of CEC . . . the *complete* data-recording line.

Some combinations possible with CEC's standard, "off-the-shelf" instruments . . .



5-119 OSCILLOGRAPH PLUS AMPLIFIER SYSTEM D . . . The ultimate in analog data-recording versatility. The oscillograph can record up to 50 data traces; the amplifier is usable to 5000 cycles. Shock mounted, rugged, with elaborate safety devices to prevent loss of data, the system is ideal for flight tests, complex wind-tunnel and test stand measurements, . . . *any* test where phenomena are both numerous and high-speed.



5-117 OSCILLOGRAPH PLUS 8-108 BRIDGE BALANCE . . . For simpler, low-frequency tests. Small and lightweight, the oscillograph can record up to six traces, uses 70-mm paper. The Bridge Balance allows direct coupling of strain gages or resistive-type pickups to high-sensitivity galvanometers in the oscillograph. Operation is extremely simple, requires little electronic experience.

NATION-WIDE SERVICE. Experienced, factory-trained service engineers stationed at CEC field offices throughout the United States are available for both emergency repairs and regularly scheduled maintenance calls. Complete stocks of spare and replacement parts are maintained in major areas, immediately available in case of emergency. Major repairs or modifications are performed by our Repair Department in Pasadena. The CEC service organization is your assurance of uninterrupted test programs.

For more information circle **6** on inquiry card.

data-recording line

ruggedness
accuracy
dependability . . .

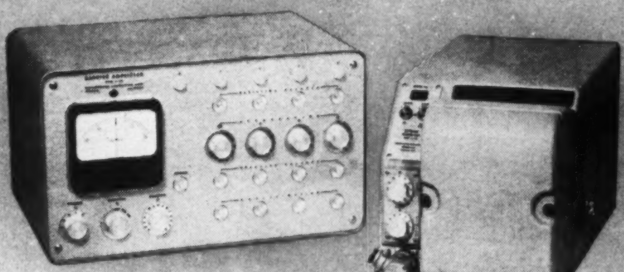
—insist on all three!

use them together . . .
use them separately . . .
use them in any combination

You can use *any* CEC oscillograph—from the economical, simple 5-117 to the advanced-design 5-119—with *any* CEC amplifier or bridge balance. All are compatible . . . no modifications are required. Keystone of this flexibility, which makes it possible to change or expand instrumentation at any time, is the 7-300 Galvanometer. Used in all CEC oscillographs, it is the "design nucleus" of all CEC analog data-processing instruments.

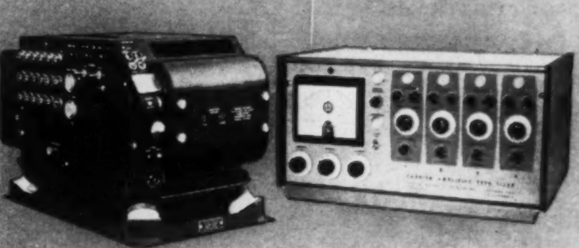
The 7-300 Galvanometer, used in all Consolidated oscillographs. Extremely stable . . . rugged . . . available in a wide range of characteristics. It brings laboratory accuracy to on-the-spot recording.

5-116 OSCILLOGRAPH PLUS 1-118 CARRIER AMPLIFIER . . . An ideal general-utility system. The 4-channel amplifier is usable for phenomena up to 600 cps with almost any type of transducer requiring external excitation. The oscillograph produces a 5-inch record at speeds from ¼" to 100" per second, available with either 9 or 14 traces, depending upon the model.



5-114 OSCILLOGRAPH PLUS 1-127 CARRIER AMPLIFIER . . . World's most widely used recording oscillograph, the 5-114 can be furnished with either 18- or 26-trace capacity . . .

Special accessories permit recording at chart speeds up to 500" per second. The 4-channel 1-127 Amplifier is usable for phenomena from static conditions to 3000 cycles.



Associated equipment to make these Consolidated instruments and instrument systems even more versatile, more convenient to operate:

OSCILLOGRAM PROCESSOR for rapid, automatic record development

PICKUPS for precision sensing of pressure and vibration

POWER SUPPLIES to permit operation any place, under any conditions

SPECIAL-PURPOSE OSCILLOGRAPHS for recording under difficult conditions of limited space, extreme acceleration, etc.

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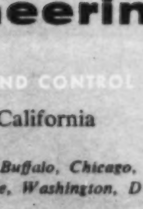
Corporation

ELECTRONIC INSTRUMENTS FOR MEASUREMENT AND CONTROL

300 North Sierra Madre Villa, Pasadena 15, California

Sales and Service Offices Located in: Albuquerque, Atlanta, Boston, Buffalo, Chicago, Dallas, Detroit, New York, Pasadena, Philadelphia, San Francisco, Seattle, Washington, D. C.

Send today for Consolidated's latest general catalog of Data-Processing Instruments. It contains brief descriptions of today's most complete line of measuring and recording instruments. Ask for Bulletin CEC 1301-X13.



For more information circle 6 on inquiry card.

NEW Advanced Design...

NEW HIGH SUSTAINED ACCURACY . . .
even under extreme operating and ambient conditions

NEW CONVENIENT ZERO ADJUSTMENT . . .
external—no need to remove weatherproof cover

FOXBORO
IN
OUT

FACTORIES IN THE UNITED STATES, CANADA AND ENGLAND

For more information circle 7 on Inquiry card.

d/p Cell Flow Transmitter...

NEW POSITIVE OVERRANGE PROTECTION . . . up to full 1500 lbs. cell rating

6 Major Achievements!

NEW FULLY ADJUSTABLE RANGE . . . from 0-50" to 0-250" H_2O differential

NEW AUTOMATIC INTERNAL DAMPING . . . fast, stable measurement

NEW SIMPLICITY . . . lowest cost installation

Pioneered by Foxboro 7 years ago, the d/p Cell* Transmitter established a new standard of performance in flow measurement and control. Over 40,000 are maintaining that standard in every branch of industry today. Technical advances, based on this unequalled experience, now have added even further reliability, economy and convenience. Call your Foxboro representative for a demonstration. Write for new Bulletin 13-11.

**Reg. U. S. Pat. Off.*

FOXBORO
REG U S PAT OFF

first in flow measurement

THE FOXBORO COMPANY, 467 NEPONSET AVE., FOXBORO, MASS., U.S.A.

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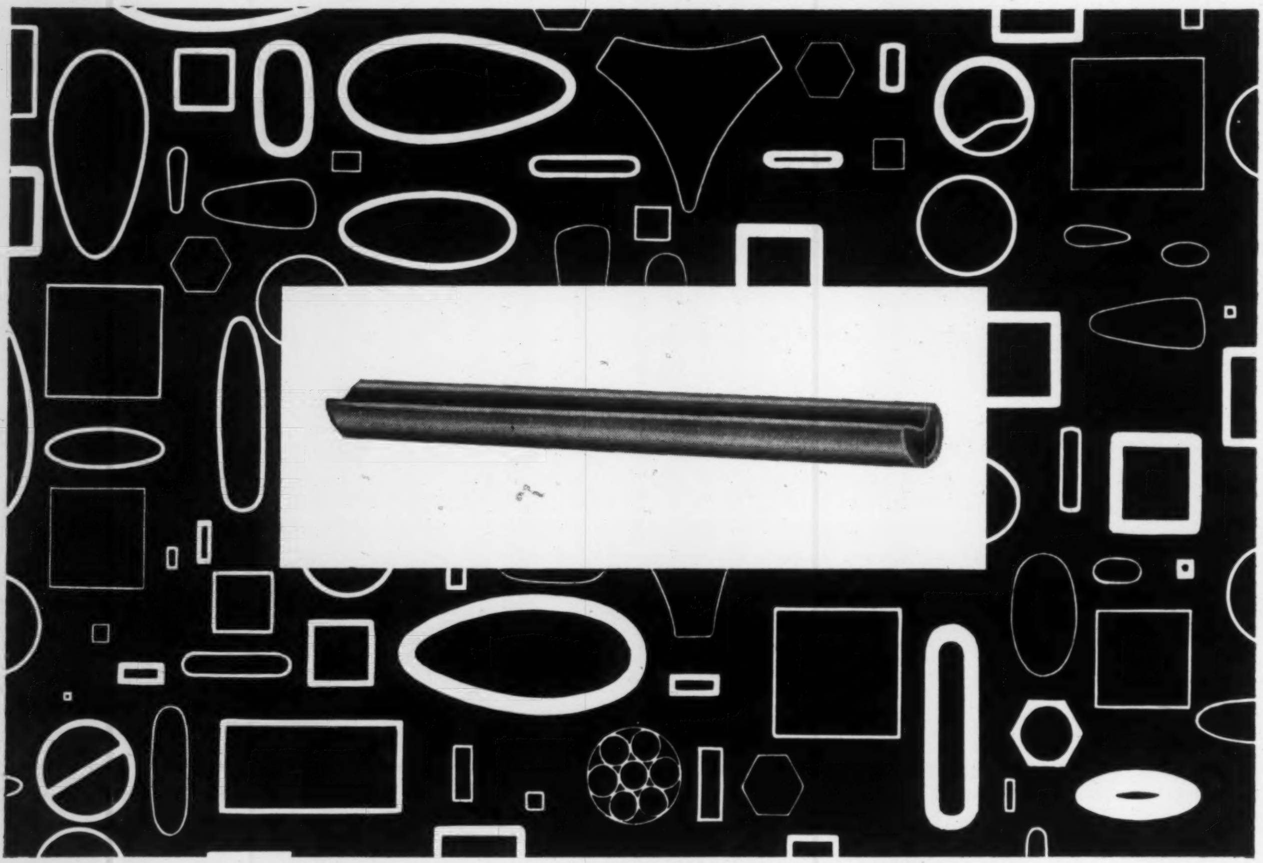


A few of the shapes available from SUPERIOR in standard specifications and tolerances or to your own design. The tube in the foreground is a gun drill shank made from 4130 alloy steel.

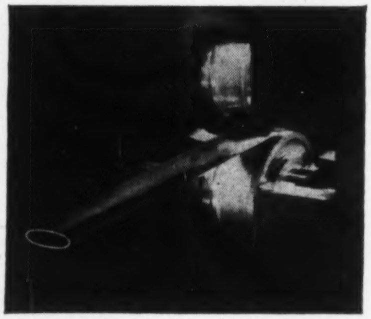
Save time and money on special shaped tubing

"SUPERIOR" TUBING IS IMMEDIATELY AVAILABLE IN A WIDE RANGE OF SHAPES, FORMS, ALLOYS

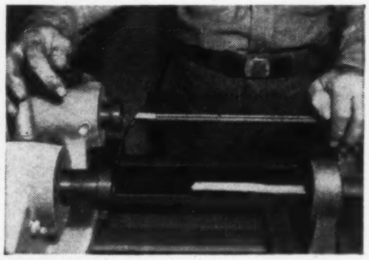
Many manufacturers have discovered that SUPERIOR's ability to supply as standard what many firms consider specialty tubing saves them trouble, time and money. SUPERIOR makes round, square, oval, rectangular, elliptical and flat oval tubing, for instance. It makes capillary tubing, pointer tubing, electronic tubing, telescopic sizes, large OD-light wall tubing. Over 55 analyses are available in carbon, alloy and stainless steels; in nickel and nickel alloys; in beryllium copper, titanium, zirconium.

The gun drill shank shown above and on the right is a good example of SUPERIOR's ability to supply unusual shapes. This newly rediscovered method of producing close-tolerance high-finish holes demands straight, rigid, accurate shanks with a 110° V-groove. SUPERIOR can produce such a shape—and others—in a fraction of the time and cost it would take a customer to form his own.

If you're having difficulty getting the kind of tubing you want, SUPERIOR can undoubtedly help you. Write for your free copy of Bulletin 40—*A Guide to the Selection and Application of Superior Tubing.* SUPERIOR TUBE COMPANY, 1968 Germantown Ave., Norristown, Pa. *On the West Coast:* Pacific Tube Company, 5710 Smithway St., Los Angeles 22, Calif.



Turks-head rollers converting a round section of SUPERIOR tubing into the typical elliptical shape for a Bourdon gage tube.



Gun drills can produce holes from 4 to 230 diameters or more in 4 times the speed of conventional drilling methods or better. Holes so produced are straight and round to tolerances of 0.0002" or less and wall finishes are 7 mu-in or better.

All analyses available in .010" to ⅝" OD; certain analyses in light walls up to 2½" OD

Superior Tube

The big name in small tubing

For more information circle **8** on inquiry card.

"She not only thinks—she even dreams!" These are the words which express the full implication of NIKE, the new guided missile that has a vital part in defense planning. NIKE seeks, locates, and destroys an airplane . . . another missile . . . anything that flies. The deadly reliability of her guidance system depends in part on *SYNCHROS* which translate electrical impulses into positioning data.

NIKE

Based on their experience, research facilities, and performance in volume production, the Precision Components Division of Norden-Ketay was chosen by Western Electric Company, prime contractor, to develop and produce special *SYNCHROS* for NIKE. Norden-Ketay also serves most of the other leaders in automatic control.

Look to Norden-Ketay for

SYNCHROS • SERVO MOTORS • DIGITAL CONVERTERS • RATE GENERATORS • RESOLVERS • MAGNETIC AMPLIFIERS • GEAR TRAINS • POTENTIOMETERS • NAVIGATIONAL SYSTEMS • FIRE CONTROL SYSTEMS • SERVO MECHANISMS • AIRBORNE INSTRUMENTS • BOMB DIRECTOR SYSTEMS • AIR DATA INSTRUMENTS • COMMUNICATION EQUIPMENT • COMPUTERS • PRESSURE GAUGES •

"Winged Victory" is the familiar name of this Greek statue of NIKE, goddess of victory, found at Samothrace, (circa 300 B.C.). Her name (pronounced 'Ny-Key') was selected by Army Ordnance as most appropriate for the ground-to-air missile developed for them by Bell Telephone Laboratories. Norden-Ketay is proud to have been chosen as an integral part of the team which produced NIKE.

NORDEN-KETAY CORPORATION
99 Park Avenue, New York 16, N. Y.

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***The Norden Laboratories,* White Plains, N. Y.**

MANUFACTURING DIVISIONS:
***Precision Components Division,* New York, N. Y.**
Commack, Long Island, N. Y., Hawthorne, California
***Instrument and Systems Division,* Milford, Connecticut**

SUBSIDIARIES: ***Nuclear Science and Engineering Corporation,* Pittsburgh, Pa.**
***Vari-ohm Corp.,* Amityville, Long Island, N. Y.**

For more information circle 9 on inquiry card.

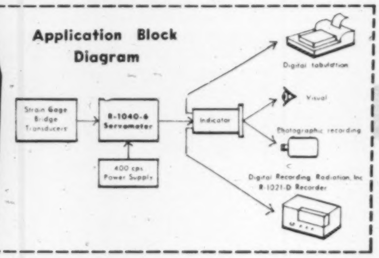
THE R-1040-6 Servometer*

A CONTROL FORCE MEASURING SYSTEM FOR INDUSTRY

that provides

1. Accurate measurements of better than ½%
2. Accurate measurement of pressure, force, acceleration, liquid flow, and position among others
3. High gain, with a frequency response of 15 C.P.S.
4. Excellent operation under adverse environmental conditions
5. Miniaturized and ruggedized construction
6. Direct operation from resistive type transducers

5 AMP
PHONE
PUSH TEST
R BAL
CAL
C BAL
RADIATION Inc


Application Block Diagram

The basic RADIATION, INC. Servometer consists of a High Gain Non-Linear Amplifier and Servometer. Reliable resistive type transducers are used to transmit information of a measured quantity to the amplifier. The signal is then amplified to a level of sufficient magnitude in order to drive the Servometer. The Servometer is designed for 110 volt, 350 to 450 cycle operation.

The versatility of the Servometer makes it adaptable to many industry functions that require measuring and/or monitoring applications. Is your application among these listed?

TYPICAL INDUSTRIAL APPLICATIONS

AIRCRAFT INDUSTRY

The Servometer will accurately measure forces applied to aileron, elevator and rudder controls for design and checkout purposes.

HEAVY INDUSTRY

With a load cell type transducer, the Servometer can be used to:

1. Weigh chemical tanks in a manufacturing process.
2. Weigh bucket loads on drag lines, both for quantitative analysis of total material removed and for overload protection to the operator.
3. Weighing ingredients in an aggregate mixing for cement plants, steel mills and feed plants.

AUTOMOBILE INDUSTRY

Employing the Servometer, accurate measurements of Power Steering Torque and Brake Pedal Forces may be obtained.

OIL INDUSTRY

Employing a resistive type pressure transducer, the Servometer will accurately measure liquid or gas pressures for monitoring purposes.

With a resistive type flow transducer, the Servometer will indicate a unit rate of liquid flow.

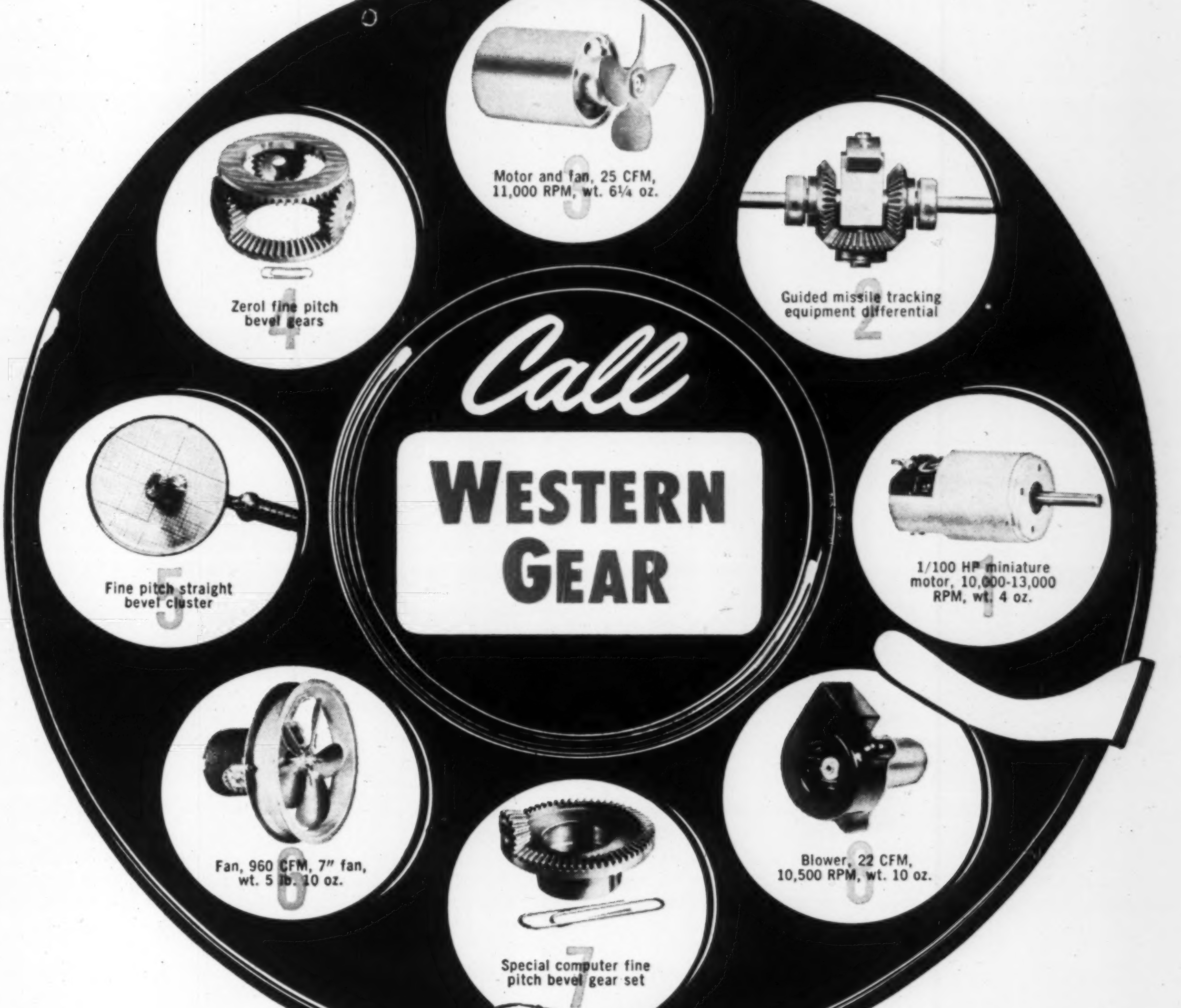
**Servometers equipped with converters can be supplied to provide digitized outputs for Recording and Telemetering purposes as well as for control functions.*

This equipment will be displayed at the Wescon Show August 24-26, 1955

* **Write for R-1040-6 Servometer Bulletin** for details of variable applications

RADIATION, Inc.
Dept. 101 • P.O. Box #37 • Melbourne, Florida

For more information circle **10** on inquiry card.


Call
WESTERN GEAR
1/100 HP miniature motor, 10,000-13,000 RPM, wt. 4 oz.
1
Guided missile tracking equipment differential
2
Motor and fan, 25 CFM, 11,000 RPM, wt. 6¼ oz.
3
Zerol fine pitch bevel gears
4
Fine pitch straight bevel cluster
5
Fan, 960 CFM, 7″ fan, wt. 5 lb. 10 oz.
6
Special computer fine pitch bevel gear set
7
Blower, 22 CFM, 10,500 RPM, wt. 10 oz.
8

...your best source for high precision gears, miniature motors

plus complete engineering service to insure correct application

High precision gears and precision fine pitch gearing available from 200 to 6 diametral pitch and dimensions from .125″ to 10″ in diameter for electronic application.

Miniature motors, more than 50 basic types available including axial and centrifugal blower designs to cover any type of equipment adaptation. Designs range from .001 to 2 HP and from 50 to 1,000 cycles in frequency, any desired voltage.

Feel free to call on Western Gear's 67 years experience in the manufacture of gears and special machinery. Write for further information or detail your requirements so that we may submit quotation. Address Executive Offices, Western Gear, P.O. Box 182, Lynwood, California.

"The difference is reliability" • Since 1888

5400

WESTERN GEAR

PACIFIC-WESTERN PRODUCTS | POWER TRANSMISSION GEARS • MACHINERY •

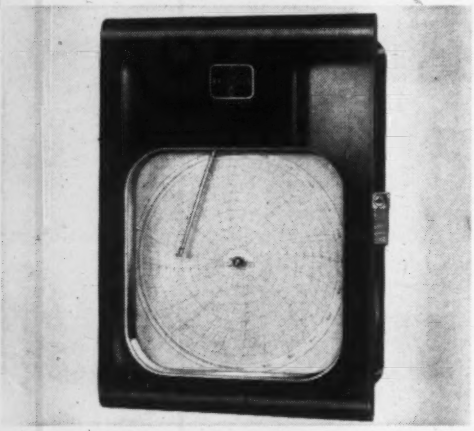
PLANTS AT LYNWOOD, PASADENA, BELMONT SAN FRANCISCO (CALIF.), SEATTLE AND HOUSTON . . . REPRESENTATIVES IN PRINCIPAL CITIES

For more information circle **11** on inquiry card.

How much do *you* know about Recording Pressure Gauges?

1

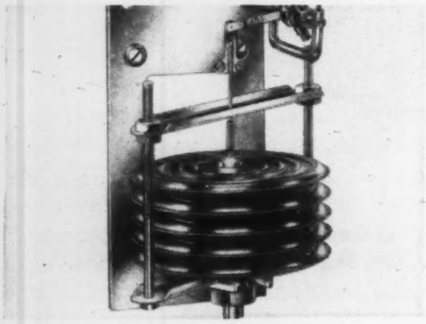
Q. Why are more Bristol Recording Gauges used than all others combined?



A. BRISTOL'S PRESSURE MEASURING ELEMENT, heart of the pressure gauge, is the big reason. Bristol Pressure Gauges, operating all over the world under all conditions – some in constant service for 20, 30, even 40 years – prove its accuracy, long life, and stability.

2

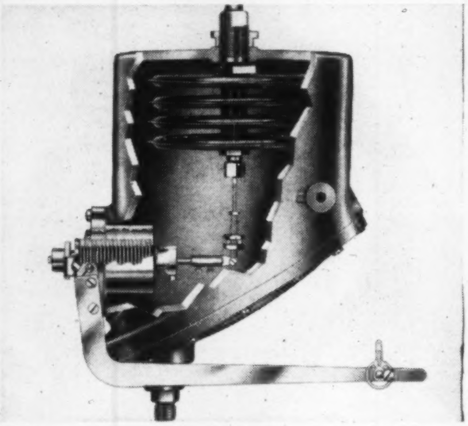
Q. What's the *right* measuring element for low pressure ranges?



A. BRISTOL'S DIAPHRAGM MEASURING ELEMENT, for ranges from 0–2 in. water to 0–29.9 psi. Extremely high torque gives positive pen positioning across entire range. It's highly accurate, extremely stable. 250% inherent over-range protection.

3

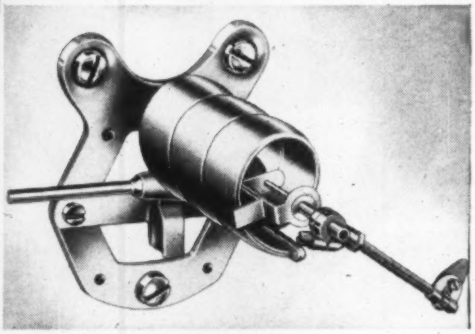
Q. What's the *right* measuring element for absolute pressures?



A. BRISTOL'S SINGLE-BELLOWS TYPE ELEMENT. It measures ranges as low as 0–6mm mercury absolute and gives direct reading of pressure above absolute zero corrected for barometric variations – with far greater accuracy than ever before.

4

Q. For intermediate and high pressures?



A. CORRECT ANSWER here is either Bristol's *Type 316 stainless steel* or *non-ferrous alloy* helical measuring elements. They're designed for ranges from 0–30 psi all the way up to 0–10,000 psi. Withstand impact of rapid fluctuations, give *permanent* accuracy over a long period of service life.

What do you get for the right answers? A free copy of our 32-page catalog G621. It tells all about Bristol Recording Gauges for recording, automatic controlling, pneumatic transmission and telemetering. Write for it today. The Bristol Company, 113 Bristol Road, Waterbury 20, Conn. 5.21

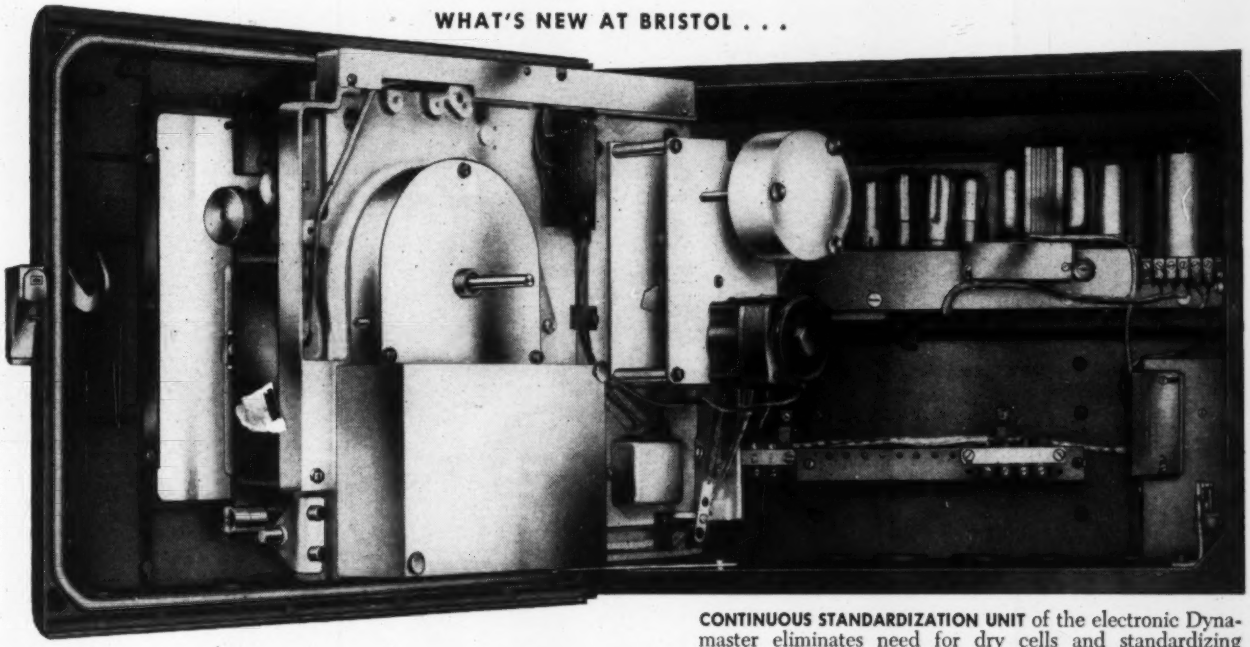
TRADE MARK BRISTOL'S REG. U.S. PAT. OFFICE

BRISTOL *POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION*

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

For more information circle **12** on inquiry card.

WHAT'S NEW AT BRISTOL . . .



CONTINUOUS STANDARDIZATION UNIT of the electronic Dynamaster eliminates need for dry cells and standardizing mechanism. Result: no interruptions in the operation of the potentiometer for standardization; no batteries to replace.

No time out for standardization here

Bristol Dynamaster potentiometer pyrometers give you No-Batt continuous standardization

- You don't have to put up with interrupted performance from old-fashioned potentiometer pyrometers any longer!

When you use a Bristol thermocouple or radiation-type Dynamaster, you get a *continuous* record or control of temperatures up to 4000°F in any type of fuel-fired or electric furnace or heating equipment. Thanks to the exclusive No-Batt continuous standardization which eliminates the need for dry cells in these electronic instruments, Bristol has been able to do away with interruptions formerly required for periodic standardization.

Bristol electronic Dynamasters are made in round- and strip-chart, single- and multiple-record recorders, air-operated and electric controllers with all types of control actions. Two-pen and program control.

For the complete story on the modern human-engineered Bristol Dynamaster, write for free 35-page booklet P1245. The Bristol Company, 113 Bristol Road, Waterbury 20, Conn.

0 2 4 6 8 10 12 14

BRISTOL DYNAMASTER CONTROLLERS in either the strip-chart model (shown above) or round-chart model, may be electrically or air operated. 2 position, 3 position, proportional, manual with automatic reset, or proportional input controls. On - off, proportional or reset air controls.

BRISTOL DYNAMASTER RECORDERS come in easy-to-read round-chart (shown here) or strip-chart models. Single record, multiple record or continuous 2 record designs are available. Bristol also supplies all types of time-temperature program controllers.

10
12
14
16
18
20
0
2
4
6
8
°F

BRISTOL

POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

For more information circle **12** on inquiry card.

still rugged . . . with NEW and IMPROVED features

The Smallest
COMPLETE FLIGHT-TEST OSCILLOGRAPH
available today

See Us At The
WESCON Show
August 24 to 26
Booths 1216-1217

Announcing the new Model 581 Oscillograph, designed to fill the need for an extremely small flight-test instrument when automatic features are needed. Dimensions have been held to a minimum without affecting its ability to obtain highly accurate recordings. It measures stresses, strains, vibrations and other physical phenomena under extreme acceleration, shock and temperature conditions. Components will withstand severe conditions of both laboratory and field usage. A few features are: *Automatic record-numbering • Automatic length control (resettable by remote control) • No-record warning • Lamp burn-out indicators • Full width timing lines at 0.01 and 0.1 seconds • Trace identification • Footage indicator • Wide selection of paper speeds*

WRITE FOR COMPLETE DETAILS

products

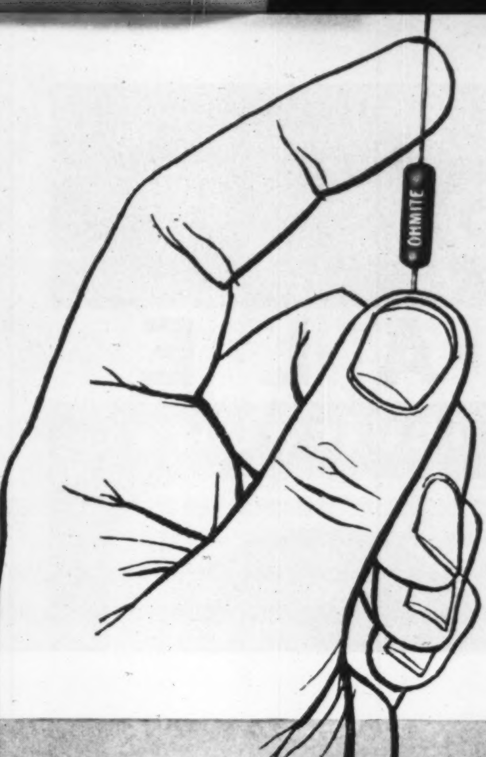
- OSCILLOGRAPHS (LABORATORY AND FLIGHT TEST)
- MAGNETIC STRUCTURES
- GALVANOMETERS
- AMPLIFIERS
- HYDRAULIC SERVOVALVES
- TORQUE MOTORS
- SERVOAMPLIFIERS
- DATA REPEATERS
- WATERPROOF CONNECTORS
- GEOPHYSICAL EQUIPMENT

MIDWESTERN MI INSTRUMENTS

MIDWESTERN INSTRUMENTS

41st and Sheridan Road
Tulsa, Oklahoma

For more information circle **13** on inquiry card.

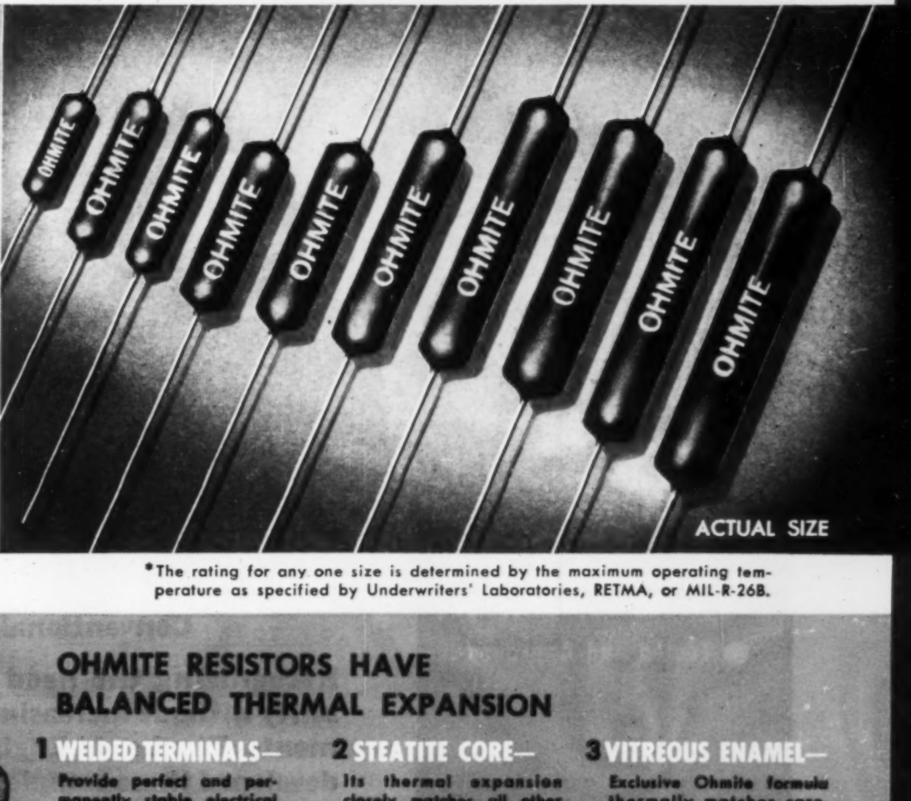


Small Size!

OHMITE® axial-lead vitreous-enameled resistors

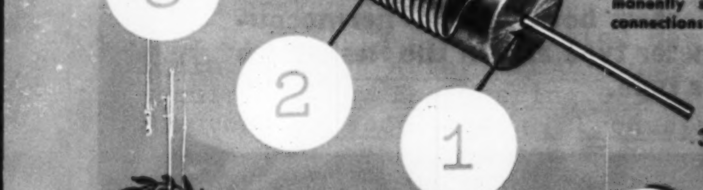
18 SIZES—3 to 15 WATTS*
3/16", 1/4" and 5/16" diameters—1/2" to 1-3/4" lengths

If you want a compact, wire-wound resistor for your tough jobs, specify Ohmite axial-lead resistors. These power-type units are designed to stand up under high temperatures. All parts—core, resistance wire, vitreous-enamel coating, and terminal bands—are "thermally balanced" to expand and contract as a unit. Terminals remain firmly anchored, cracking is eliminated, and moisture cannot enter the resistor.



ACTUAL SIZE

*The rating for any one size is determined by the maximum operating temperature as specified by Underwriters' Laboratories, RETMA, or MIL-R-26B.



OHMITE RESISTORS HAVE BALANCED THERMAL EXPANSION

1 WELDED TERMINALS— Provide perfect and permanently stable electrical connections.

2 STEATITE CORE— Its thermal expansion closely matches all other materials in the resistor.

3 VITREOUS ENAMEL— Exclusive Ohmite formula thermally matches core, terminals, and wire.

Write for Bulletin 147

OHMITE MANUFACTURING COMPANY
3615 Howard St., Skokie, Illinois (Suburb of Chicago)

30th Anniversary
1925-1955

OHMITE®

RHEOSTATS · RESISTORS · RELAYS · TAP SWITCHES

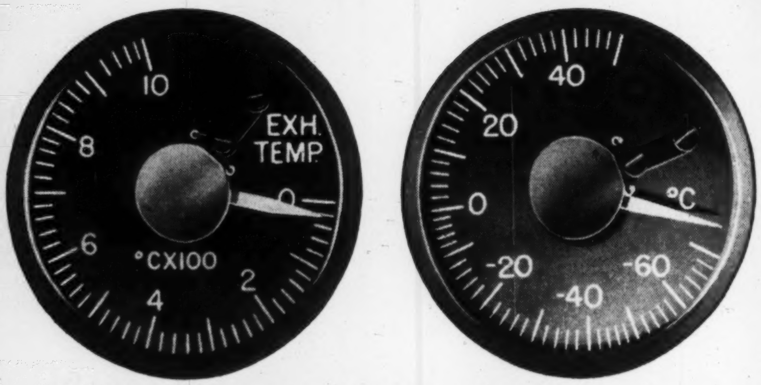
For more information circle 14 on inquiry card.

for improved readability, specify the new **LEWIS**

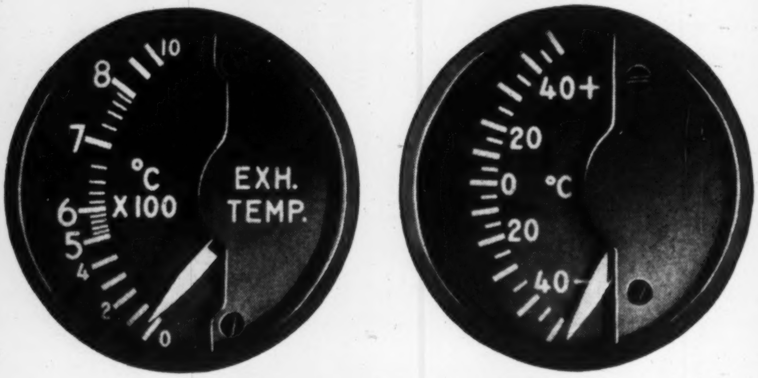
LONG SCALE

aircraft temperature indicators

- Standard AND10412 cases
- Scale arc approximately 250°
- No auxiliary components
- No vacuum tubes
- Operate the same as conventional thermocouple type or resistance type temperature indicators
- Interchangeable with conventional temperature indicators, use standard resistance bulbs or thermocouples and leads
- Made to Military Standard Specifications
- Tested and Approved



COMPARE the improved readability of these long scale indicators with these . . .



Conventional indicators

Recognizing the need for improved readability without increasing panel space requirements, The Lewis Engineering Company has developed these completely new Aircraft Temperature Indicators both in the Thermocouple Thermometer type and in the Resistance Thermometer type.

the LEWIS ENGINEERING COMPANY
naugatuck, connecticut

For more information circle **15** on inquiry card.

Trends...

INSTRUMENTS and AUTOMATION

Trend to continuous recording of micro-weights in analytical research is predicted on basis of new development disclosed for first time on pages 1104-06 of this issue—a technique for obtaining microbalance sensitivity plus continuous recording from almost any analytical balance. Technique can cause new approach philosophy in analytical research.

Ultrasonics is expanding field. Applications are growing in (1) cleaning and degreasing of precision parts, (2) thickness gaging and fault location, (3) drilling and cutting of precision parts, (4) medical therapy, (5) homogination of foods.

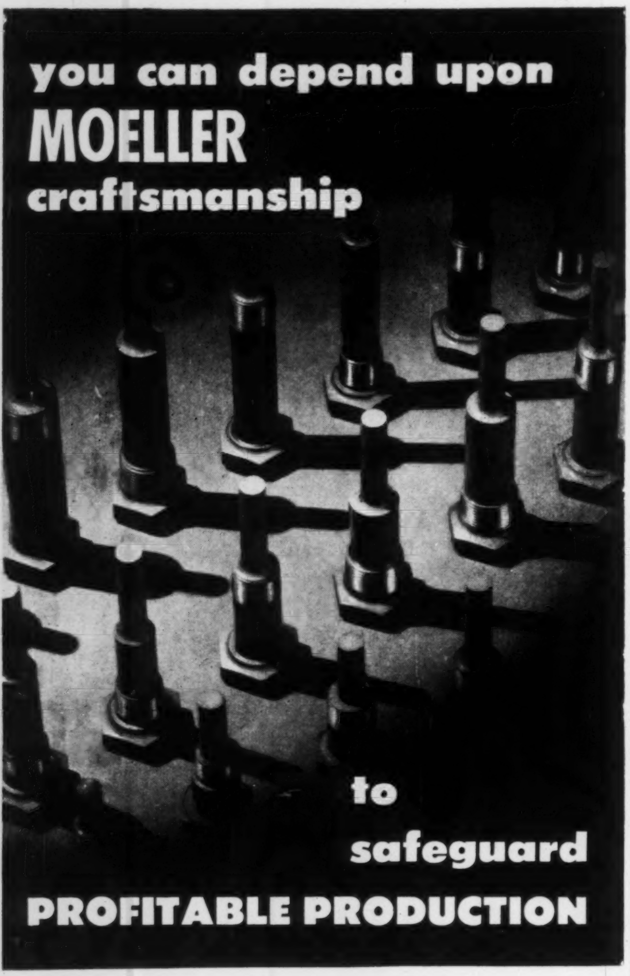
Fourfold increase in use of relays within next decade is predicted by Elgin National Watch Co.; J. G. Shennan, President, says that industry will use half the total market for miniature relays by 1965.

Remote switching via carrier-current is expanding industrial field. Existing a-c lines are transmission medium; tone modulation permits multichannel operation.

Effect of automation from 1930 to 1955: gross national product has quadrupled; number of employees in industry has doubled; number employed at unskilled labor has halved; work week has declined from 48 to 40 hours; average industrial earnings have more than tripled.

South African market for industrial and process instrumentation is expanding. U.S. sales in S. Africa from 1951-54 were almost $2 million; 1954 sales were triple 1951 sales.

Highlights of an expanding industry—Texas Instruments Incorporated has acquired Radell Corp of Indianapolis, makers of deposited carbon resistors; Rockwell Mfg. Co. opens new 81,500-sq-ft plant at Uniontown, Pa.; Reon Resistor Co. of Yonkers, N. Y. purchases Columbia Resistors, Inc.; Consolidated Engineering Corp. announces new $1.5 million 120,000-sq-ft expansion in Pasadena; Elgin National Watch Co. has purchased Advance Electric & Relay Co. of Burbank; Foxboro has opened new 8400-sq-ft plant at San Leandro, Calif.; Jordan Electronics, subsidiary of Panellit, has broken ground for new 12,000-sq-ft plant at Alhambra, Calif.; P. R. Mallory has completed new $1.5-million plant in Huntsville, Ala.; Norden-Ketay and Acragage merge; Askania Regulator Co. acquires Heinz Engineering Co. of D. C.; Industrial Instruments Inc. purchases Wood & Metal Products of Mich.; Sperry Electronic Tube Div. announces new 60,000-sq-ft plant for Gainesville, Fla.; Automatic Temp. Control Co. has been purchased by The Safety Car Heating & Lighting Co. of New Haven, Conn.; Sun Oil Co. has licensed Fielden Div. of R-F to manufacture Sun-developed instruments; Assembly Products of Chesterland, Ohio, plans new plant in S. Calif.; F. W. Dwyer Co. is building new plant at Michigan City, Ill.; Helipot plans new $2-million plant in S. Pasadena.

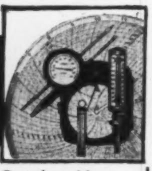


Moeller Thermo-wells, Thermo-couple protecting wells, and separable sockets are the answer to —

- ★ Baffling problems of scientifically testing temperature readings and recordings, and,
- ★ Making possible the most intricate types of thermometer installations.

Produced on specially designed equipment, these precision parts are drilled true and are concentric with the outside diameter. The surfaces are machined and tooled to the closest tolerance to permit maximum speed of response to temperature changes. Made in various alloys. Send for details today.

MOELLER
INSTRUMENT COMPANY
132nd ST. and 89th AVE.
RICHMOND HILL 18, N. Y.
Representatives in Principal Cities



Gentlemen: Without obligation, please send me Catalog No. 850 on Moeller Thermo-Wells, Thermo-Couple protecting Wells and separable sockets.

NAME ....
FIRM ....
ADDRESS ....
CITY .... ZONE .... STATE ....

For more information circle **16** on inquiry card.

Stock Report . . . .

INSTRUMENTS and AUTOMATION

The following prices and price ranges are supplied by Bache & Co., 36 Wall Street, New York 5, New York

New York Stock Exchange:

Security	Price Range for Year Thru May 31 High	Low	As of May 31 Last
American C. & C.	40 1/2	35 1/2	38 1/2
American Mach. & F.	35 7/8	25	30
American Mach. & M.	41 3/8	27 1/2	40
American Optical	53 1/4	39 1/8	47 3/4
Bell & Howell	42 1/4	30 1/2	37 - 37 3/4 (4)
Bendix Aviation (1)	59 1/2	48	52
Bulova Watch	62 1/2	50 3/4	56
Burroughs	31 5/8	22 7/8	29 1/4
Clevite	25 3/8	20 3/4	22 3/8
Daystrom	32 1/2	23	27 1/4
Dobeckmun	37 3/4	30 1/4	34 - 34 3/4 (4)
Gamewell	39	31 1/2	34 7/8
General Inst.	13	10	11
General Prec.	71 1/2	44 5/8	54 3/4
General Time	39 3/4	35	35 1/2
Hamilton Watch	25 1/4	20	22 - 22 1/2 (4)
Int. Bus. Mach.	450	349	418
Minneapolis-Hon.	65	53	65
Nat'l Cash Reg. (2)	47	37	41
Radio Corp.	52	36 3/4	52
Raytheon	25 3/4	18	23 3/8
Rem. Rand	48 5/8	31 5/8	44 1/2
Robertshaw - F.	33 3/8	28	31
Sangamo Electric	30 3/8	26	27 3/4 - 28 (4)
Sperry Corp. (3)	73 3/4	39 3/4	70 3/4
Square D	52	43 1/2	48
L. S. Starrett	50	43 3/4	42 1/2
Sylvania Elec.	48 3/4	41	47 3/4
Telautograph	37 1/2	25 1/2	35 1/4-36 3/4 (4)
Texas Inst.	16 7/8	12 5/8	15 1/8
Underwood	38	33	37 1/8

American Stock Exchange:

Security	Range for 1955 High	Low	As of May 31 Last
Aeroquip Corp.	17 1/2	8 1/2	14 1/2
Air Assoc.	12 3/4	10 1/8	11 3/8
American Meter	35	32 5/8	33 3/4
Beckman Inst.	26 7/8	20 1/2	20 3/4
Benrus Watch	10 7/8	9 5/8	9 7/8
Breeze Corp.	8 7/8	5 3/4	7 5/8
Clarostat Mfg.	8	5 7/8	6 5/8
Consolidated Eng.	31 1/4	24 1/2	27
DuMont Labs.	17 1/8	13 1/4	15 7/8
Electro Data	17 7/8	12	14 3/4
Fairchild C & I	37 1/4	26 1/2	27 3/4
Int'l Resistance	8 7/8	5	7 7/8
Lear Inc.	13 3/8	9 1/8	10 1/4
Nat'l Res. Corp.	33 1/4	26	28 5/8
Neptune Meter	26 3/8	21	24 3/4
New Haven Clock	3 7/8	2 1/2	3 5/8
Norden - Ketay	19 1/2	13 3/4	14 1/8
Pneumatic Scale	30 1/2	27 1/2	29 3/4 - 31
Servomechanisms	13 3/8	8 1/4	9 1/8
Wallace & Tiernan	26 7/8	22 3/8	23 - 23 1/2
Waltham Watch	2 7/8	1 3/8	1 5/8

(1) Qts. are for 'new' stock. Common split 2 for 1.

(2) 2 for 1 split.

(3) Stock to be split.

(4) Bid-ask price, no sale.

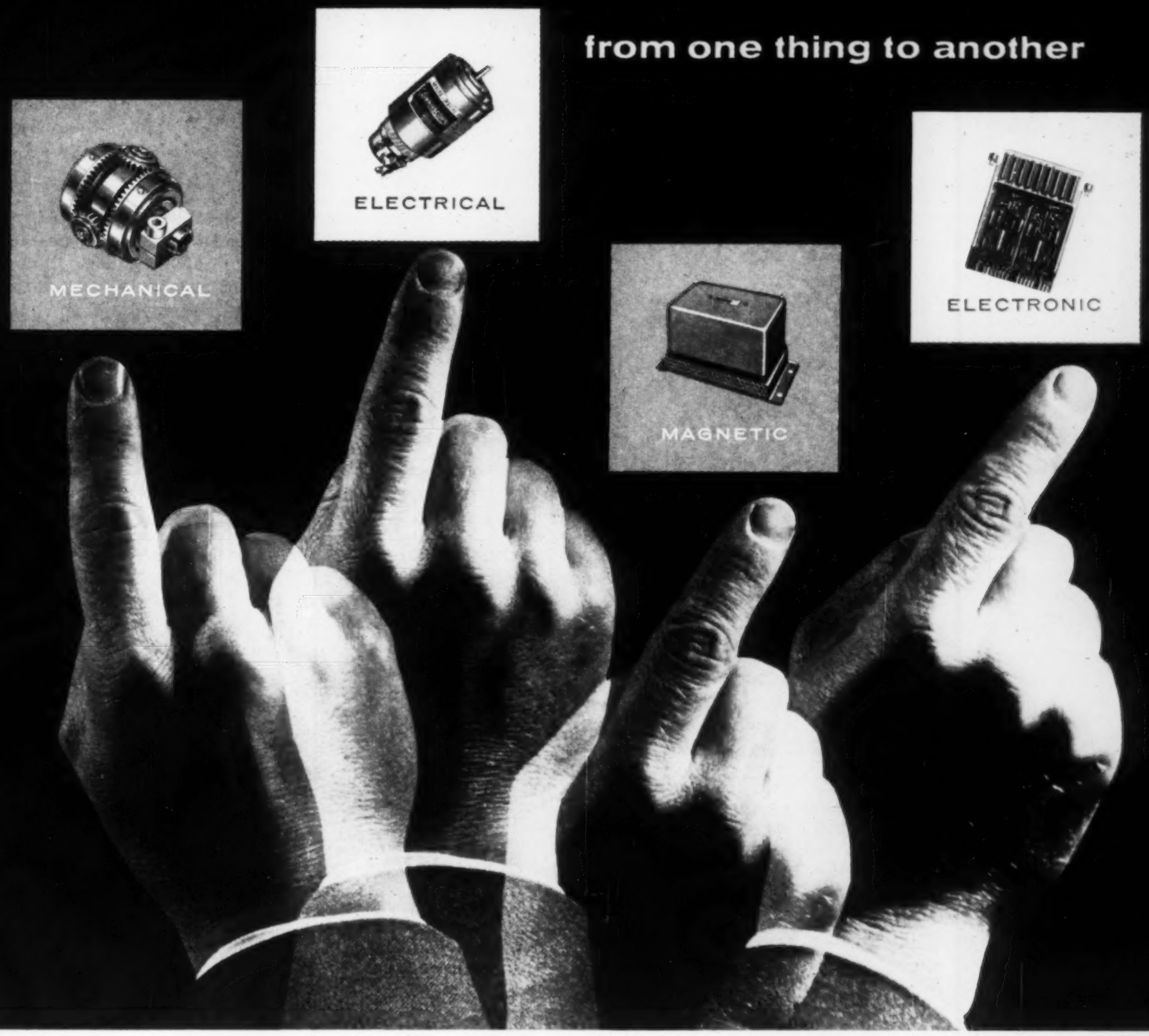
PLAN NOW to attend . . .

2nd International Automation Exposition

See pages 1100 and 1137 for more details.

TURNING WITH EASE...

from one thing to another



One standard to follow in selecting a designer for your specialized electronic control systems is to choose a firm that builds its *own* components for the control systems it makes. Librascope, Inc. manufactures such diverse electronic components as read-record heads, drums, magnetic amplifiers, flip-flop cards, packaged circuitry, analog-digital converters and other devices for subassemblies in its own military and commercial systems packages. This versatility of "turning with ease from one thing to another" indicates a competence for overall systems design acquired through nearly two decades in computer-control manufacture. Such highly specialized experience is available for the solution of your data-handling or computer control project. Inquire today.

Librascope also manufactures mechanical and optical components for computers and controls. Send for booklet describing the company.

Engineers in search of interesting assignments, security, advancement—contact Mac McKeague, Personnel Director.

LIBRASCOPE

A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORP.

LIBRASCOPE, INC. • 808 WESTERN AVENUE • GLENDALE • CALIFORNIA

For more information circle **17** on inquiry card.

whatever meter or controller
you buy . . .

SPECIFY

I.I.C. non freezing
meter bearings*

*Foxboro
*Taylor

*Emco
*Brown
*Metric
*and others

patented

The non-freezing, free-floating stainless steel bearing designed and patented by I. I. C. is the answer to leaking, friction and corrosion. Thousands of I. I. C. bearings have, to date, given over 5 years of trouble-free service without a single replacement.

This bearing requires no lubrication or shaft end thrust adjustment, gives pinpoint accuracy clearly out of the range of ordinary bearings.

*The unique I. I. C. bearing is manufactured as replacement for Brown, Emco, Foxboro, Metric and Taylor meters and for many other special applications.

All I. I. C. non-freezing meter bearings are unconditionally guaranteed to give satisfactory service for a period of one year. At expiration of warranty, exchange-repair bearings are priced at only 50% of list. Trade-in allowance of 5% is made on all bearings of other manufacture when I. I. C. bearings are purchased on changeover.

Make your own comparison of the I. I. C. non-freezing bearing under actual pressure calibration. Then you'll see for yourself that this bearing sets completely new standards for accuracy.

THIS IS NOT A TEFLON BEARING.

For full information—including the name of your nearest representative—write for Bulletin 52-R.

INDUSTRIAL INSTRUMENT CORP.
DRAWER 152 ODESSA, TEXAS

For more information circle **18** on inquiry card.

Books...

INSTRUMENTS
and
AUTOMATION

Computing Manual, by Fred Gruenberger. 3d. ed., second printing, 1953. Univ. of Wisconsin Press, Madison, Wis. 123p. $2. 9¼in. Intended for training in machine computers, especially for work with punched cards. Reproduced from typewritten copy.

The Coming Revolution in Industrial Relations, 1955-1975; 115 Vital Questions and Answers on How to Meet the Changes Ahead! (C1955.) Industrial Relations News, 230 W. 41st St., New York, N. Y. 76p., unbound. $4. 9 in. A 10-page chapter on "A Revolution in the Plant?" is concerned mainly with automation.

Chemical Process Machinery, by Emil Raymond Riegel. Ed. 2, 1953. Reinhold Publishing Corp., New York 36, N. Y. 735p. $12.50. 9¼ in. First edition, entitled "Chemical Machinery", is here revised with addition of considerable new material. Includes 597 figures reproduced from line drawings or photographs.

Bibliography and Index on Dynamic Pressure Measurement, by W. G. Brombacher and T. W. Lashof. 1955. National Bureau of Standards. U.S. Government Printing Office, Washington 25, D.C. 124p., unbound. 75 cents. 10 in. (Circular 558.) Contains 850 references to books, periodicals and reports giving no information beyond the titles. Includes some references to instrumentation ordinarily considered suitable only for static measurements. Reproduced from typewritten copy.

Basic Vacuum Tubes and Their Uses, by John F. Rider and Henry Jacobowitz. (C1955.) John F. Rider, New York 13, N.Y. 204p., unbound. $3. 8½ in. Theory and operation of basic types presented with a minimum of mathematics.

Basic Electronics, by Van Valkenburgh, Nooger & Neville, Inc. (C1955.) John F. Rider, New York 13, N.Y. 5v., unbound. $9. 9 in. Course currently taught in "Navy Specialty Schools" and now released for civilian use.

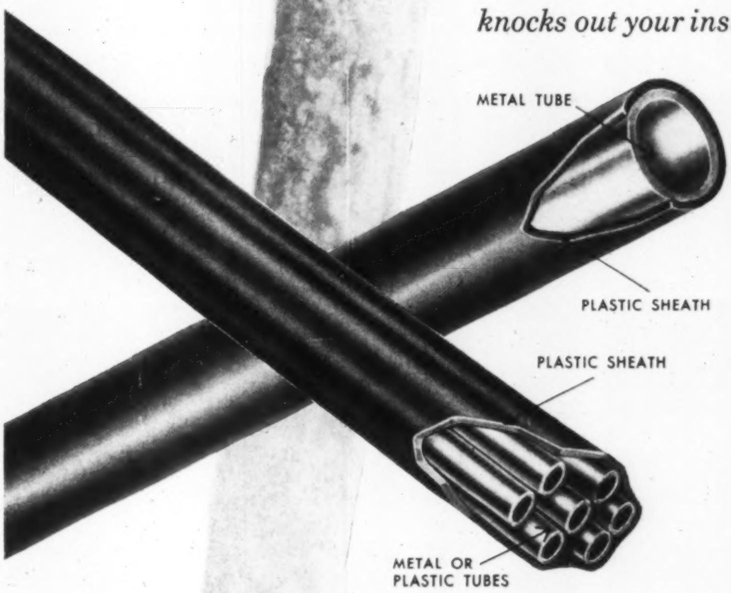
Basic Circuitry of the MIDAC and MIDSAC, by J. E. De Turk and others. 1954. Univ. of Michigan, Engineering Research Institute, Ypsilanti, Mich. various paging (116p.), unbound. $2. 11 in. Design and circuitry of two large-scale digital computers.

Automatic Control Bibliography, by Warren F. Wade and Emory N. Kemler. (c1955.) Summary Reports, Spring Park, Minn. 331p. $15. 9 in. Contains 1623 annotated references to magazine articles about two-thirds of which are arranged alphabetically by names of authors and the remainder by titles of magazines. This list is accompanied by a rough approach by subjects. There is a separate list of 120 books. Reproduced from typewritten copy.

Advanced Mathematics for Engineers, by H. W. Reddick and F. H. Miller. Ed. 3. (c1955.) John Wiley & Sons, New York 16, N.Y. 548p. $6.50. 8½ in. Includes differential equations, hyperbolic functions, Fourier series, vector analysis, probability, functions of a complex variable, operational calculus, and gamma, Bessel and Legendre functions.

DEKORON INSTRUMENT TUBING

knocks out your instrument line corrosion problems



DEKORON single-line tubing. Samuel Moore & Co. will coat your copper, aluminum or steel tubing by the Dekoron extrusion process, or will supply coated tubing. Straight lengths to 20 ft., coils to 1000 ft.

DEKORON IMPERVAPAK is a multiple tube harness of plastic or metal tubes encased in tight plastic sheath. Multiple tube construction cuts down installation costs.

Corrosion endangers the life line of your plant—your instrument tubing. That's why you should investigate Dekoron instrument tubing, the tubing that's impervious to moisture, salt air, corrosive atmospheres, and chemicals.

That means Dekoron eliminates replacement costs and maintenance. Other advantages are low initial cost . . . less plant down time . . . easy installation with standard fittings and plastic tape.

In replacement savings alone—not including lower maintenance and installation costs—Dekoron Instrument Tubing pays for itself over and over again.

AA-766

Send for free copy of Bulletin L-6506 "3 Ways to Whip Corrosion and High Tubing Installation Costs in Your Plant."

Dekoron® products

QUALITY • RESEARCH • SERVICE
SAMUEL MOORE & COMPANY
DEKORON PRODUCTS DIVISION
MANTUA, OHIO

For more information circle **19** on inquiry card.

News...

INSTRUMENTS and AUTOMATION

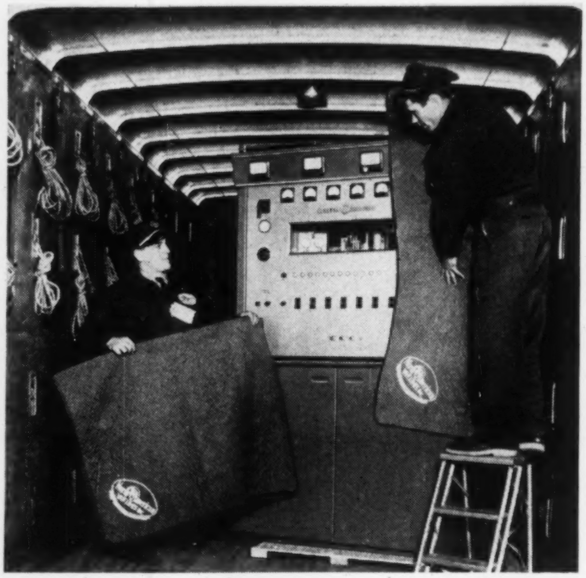
Automatic Sextant

ELMHURST, N. Y.—Despite the many aids to navigation, the sextant, the first navigation aid, is still the basic navigational instrument. Here is an experimental model of the first automatic sextant to be devised. The tracking device shown automatically sights and tracks the sun at daytime or stars and planets at night. A photosensitive telescope automatically searches for the selected celestial body; aurora, haze, and moonlight have no effect. Made by the Kollsman Instrument Company, Elmhurst, N. Y., the device will simplify the job of the navigator, and reduce possibility of human error.

Vans Reduce Costs In Shipping Displays

The Exhibit Display Department of North American Van Lines, Inc., Fort Wayne, Indiana, has solved many problems for exhibitors in getting all kinds of display components, including those requiring extreme care in handling, from place to place with minimum expense. North American's Exhibit Display Department is under the direction of Blake Dempster, of the Fort Wayne office, as Exhibit Display Manager.

Realizing that the "show must go on," special attention is given to scheduling on-time arrivals and departures of exhibit displays. North American maintains the most elaborate direct leased-wire communications system in the moving industry with strategically located dispatching points throughout the United States and Canada.



Savings result from a minimum need for crating and crate storage because soft, quilted pads, tie-offs inside the van, etc., are employed to protect shipments. Because expensive crating can be largely eliminated, set-up and dismantling time is reduced, releasing the exhibitor's personnel for more productive work, and also saving lay-over expenses they might otherwise be likely to incur. Single coverage which protects a display in transit, while on exhibit, and in storage is also made available, cutting down on the insurance item.

On arriving in Los Angeles with displays for the September 12-16 Instrument Exposition & Conference, Mr. Dempster states, North American Van Lines will be prepared to consolidate shipments for individual exhibitors in van loads destined for the Chicago Automation Exposition to be held November 14-17. The moving firm also will arrange for display storage between shows, either at the West Coast origin or at destination.

Computer Scholarships

PASADENA, CALIF.—Five graduate students from leading U. S. universities have been awarded $500 scholarships from ElectroData Corporation for a summer industrial training course in electronic computers. Dr. Paul Brock, Technical Services director in charge of the program, said the students will undergo 10 weeks of intensive work at the ElectroData computing center in Pasadena—learning not only the language and use of high-speed digital computers, but also the management of a computer firm.

Brain-Wave Computer

CAMBRIDGE, MASS.—A new electronic computer—the Analog Correlator—for analyzing the rapid and complex electrical activity of the brain is now in preliminary tests at the Massachusetts Institute of Technology and the Massachusetts General Hospital. Dr. Norbert Wiener, Professor of Mathematics at M. I. T., is largely responsible for the mathematical developments which are the basis of this method. The equipment was developed in the Research Laboratory of Electronics at M. I. T. in con-

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For 48 years, Kirk and Blum has been fabricating steel components for some of the nation's outstanding manufacturers . . . and maintaining their confidence with substantial savings in time and cost. Whatever the nature of your fabrication, you can be sure that Kirk and Blum will exercise the same care you demand of your own organization.

Kirk and Blum maintains complete facilities and special equipment for the fabrication of sheet metals and light structurals. Copper, aluminum, monel, stainless and other alloy fabrication is a Kirk and Blum specialty.

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CINCINNATI 9, OHIO

For more information circle **20** on inquiry card.

BARKSDALE PISTON PRESSURE SWITCH
THE SERVIS RECORDER

Its features in terms of application with the Servis Recorder

In this application the Servis Recorder (with a Barksdale Piston Pressure Switch) is used to check on minimum loads, movements and generally on productive time of fork lift trucks.

FEATURES	APPLICATION
NOT CRITICAL TO VIBRATION and will operate in any position.	This feature is most important to the Servis Recorder in its use on the fork lift where it must function with accuracy under vibration, bumping or shaking.
PROOF PRESSURE TO 7000 PSI and actuation as low as 15 PSI.	Even though the minimum load setting may be relatively low, the surges due to jolts or bumps cannot upset the switch accuracy.
±2% REPEAT ACCURACY because of honed piston bore and direct switch action.	Accuracy is invaluable to the Servis Recorder and the Barksdale switch retains its repeat accuracy, even after long service, because there are no wearing parts to cause the settings to drift.
LONG, LONG SERVICE LIFE They last *millions* of cycles because of simplicity, rugged construction.	The constant cycling in loading and unloading operations day after day makes it imperative for the accuracy of the Servis Recorder that the switch have a long service life.

BARKSDALE VALVES

PRESSURE SWITCH DIVISION

If these features suggest a solution to your problem, please write for Bulletin 9612.

5125 Alcoa Ave., Los Angeles 58, California

For more information circle **21** on inquiry card.

junction with a research group at the Massachusetts General Hospital. Dr. John S. Barlow of the Massachusetts General Hospital and Mr. Robert M. Brown of M. I. T.'s Research Laboratory of Electronics began work in 1952 on the analog correlator, a type of specialized computing machine. The machine has been in use for several months in tests conducted under the direction of Dr. Mary A. B. Brazier, Neurophysiologist to the Neurological Service at the Massachusetts General Hospital, and Dr. Walter A. Rosenblith, Associate Professor of Communications Biophysics at M. I. T., both important contributors to the machine's development.

Data Cruiser

LOS ANGELES, CALIF.—The Benson-Lehner "Data Cruiser," a mobile unit with a complete data-handling system, is touring the United States, visiting government experimental labs, missile proving grounds, oil companies, chemical plants, and other industrial laboratories. The $100,000 "Data Cruiser" is equipped with the complete line of the company's machines, including the "BOSCAR" electronic data handler.

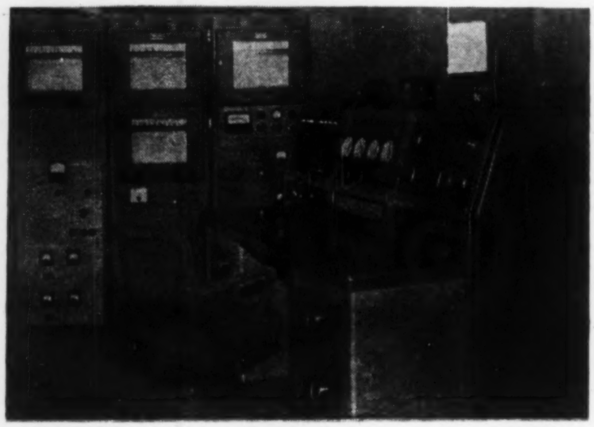
benson lehner corporation
DATA CRUISER

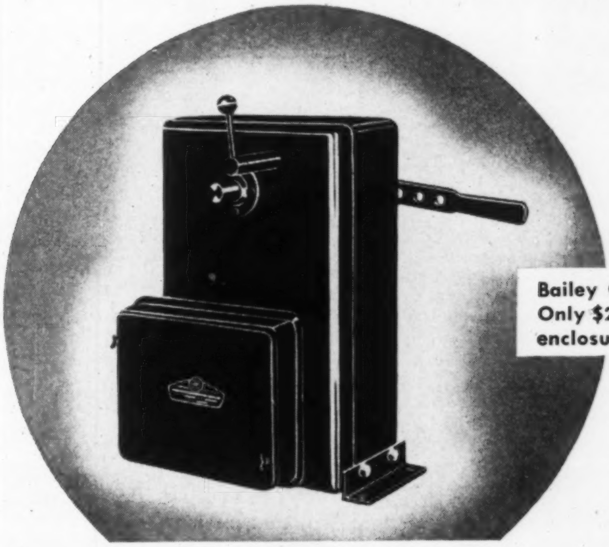
Free Prototype Thermocouples

SCHENECTADY, N. Y.—Advance prototypes of exhaust-gas thermocouples are offered free of charge to jet-engine manufacturers by General Electric in an effort to help speed up manufacture of defense equipment. Installed in the tail pipe or cone of a jet engine, the thermocouples monitor temperatures up to 2000 deg. F. The devices warn the pilot of "flame-out," critical heat, and assist in indicating if engine is developing rated thrust.

Reactor Control

IDAHO FALLS, IDAHO.—The small research reactor at National Reactor Testing Station, Idaho, is controlled





Bailey Control Drive, Type AC44P Model 200. Only $210.00 F.O.B. Cleveland, complete with enclosure, positioning relay and hand operator.

Want Better Flow Characteristics from Your Regulating Devices?

This new, small, piston-operated Bailey Control Drive will improve the flow characteristics of butterfly valves, dampers, hydraulic couplings, feeders and similar regulating devices. Adjustment is simple; any desired relation between drive motion and pneumatic signal may be secured.

You can install this compact pneumatic drive power unit in any position on a column, pipe, or flat surface—and connect it to the regulating device with standard Bailey linkage, available from stock.

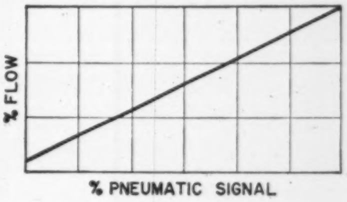
Speed (time required for full travel) is adjustable to suit your requirements. Bailey Control Drives operate on standard SAMA pneumatic signal ranges of 3 - 15 or 3 - 27 psig.

AVAILABLE FROM STOCK in 3 standard sizes

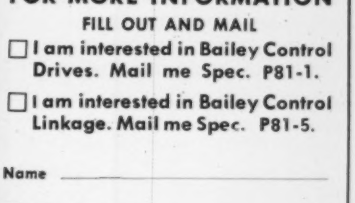
Type	Piston Dia. Inches	Piston Stroke Inches	Torque ft-lb	Max. Travel Degrees	Approx. Dimensions Inches
AC816	8	16	1500	90	13 x 27 x 51
AC68	6	8	400	90	13 x 19 x 34
AC44	4	4	75	75	10 x 11 x 19

P-28

The New Bailey Control Drive gives you THIS—



instead of THIS



BAILEY

METER COMPANY

1041 IVANHOE ROAD

CLEVELAND 10, OHIO

Complete Controls for Process Plants

BAILEY METERS

Controls for

TEMPERATURE

PRESSURE

GAS ANALYSIS

FLOW LEVEL

RATIO

FOR MORE INFORMATION

FILL OUT AND MAIL

☐ **I am interested in Bailey Control Drives. Mail me Spec. P81-1.**

☐ **I am interested in Bailey Control Linkage. Mail me Spec. P81-5.**

Name ____________________

Title & Company ____________________

Street & Number ____________________

City & Zone __________ State __________

For more information circle **22** on inquiry card.

MINIATURIZATION
From Pilot Plant to Process

"BANTAM" 500 SERIES
Throttling "Bantam" Diaphragm Control Valves for all standard control valve uses, Cv of 0.6 and below, up to 1000 psi and 500°F, characterized, renewable trim, 316 stainless steel and teflon only wetted surfaces, low in hysteresis, size and weight, a modern design of control valve. 2000 series "Bantam" Control Valves available for on-off service.

TUBE AND PIPE CONNECTORS
For use in such systems as aircraft or marine applications where weight is a factor, these connectors replace standard flanges. Available in various materials, in male or female socket or butt weld design, for tubing, and up to schedule 40 pipe.

"DEMI" PACKLESS VALVES
For services when packing is a problem, manifolding of small valves in one unit, these low cost valves have a great popularity. For services up to 1500 psi and 500°F., screw, toggle, or diaphragm operated, the "Demi" line is ideal for panel mounting up to five valves in one block.

WHIFFLETREE OPERATOR
Two valves operated simultaneously by one operator. Valves may be globe or three-way and have a multitude of piping arrangements for mixing and routing applications.

MANUAL RESET
Wherever control air on dangerous or toxic process flows must be blocked for safety, on air failure until manually reset, these valves insure against disaster. Standard sizes ¼" and ½" I.P.S.

SAUNDERS VALVES — AIR OPERATED
Plastic valves, 2" and below, metal valves 1" and below, G. W. Dahl Company, Inc. diaphragm operators on these valves provide simple, sure automatic operation. Each application must submit full flow information.

Write us for complete technical information, or the address of our representative in your area.

George W. DAHL Company
BRISTOL, RHODE ISLAND

For more information circle **23** on inquiry card.

by this control console and instrumentation. Coarse control of reactor power is made by a shim rod, positioned by pistol-grip switch on left side of right-hand panel on console. Indicators on center panel of console indicate power level and reactor period; lower central panel is galvanometer for power indication. Other controls are for manual "scram" and resetting of reactor. Lights indicate functioning of safety circuits. Brown Instruments recorders on racks make recordings of power level, regulating rod position, and temperature in reactor core. The system was designed by Phillips Petroleum Co., AEC Contractor at NRTS.

Miniature Metameters

PITTSBURGH, PA.—More than 100 Bristol miniature Metameter telemeter receivers will be incorporated in the

newly installed telemetering system of the Manufacturers Light and Heat Company, Pittsburgh, Pa. The system allows for phone communication and remote control. Dave Ruth, Chief Communications Engineer of Manufacturers is shown demonstrating the system to members of the Columbia Gas System Communications Engineers.

Plant Uses Planned Air System

ERIE, PA.—Reputedly the most modern manufacturing plant in the hospital equipment field, American Sterilizer Company's new facility just west of Erie, Pennsylvania, uses planned distribution of compressed air power. A large percentage of the steps in manufacturing sterilizers and general hospital equipment lean heavily

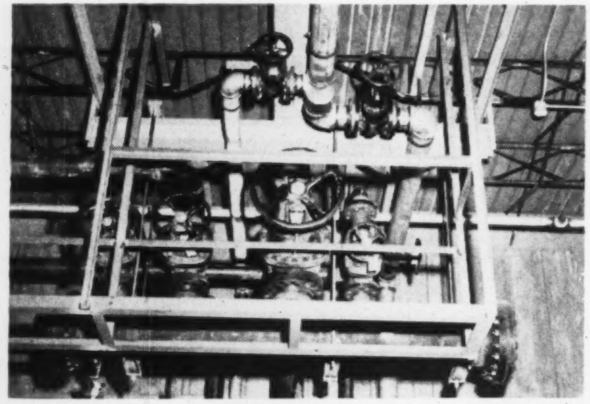
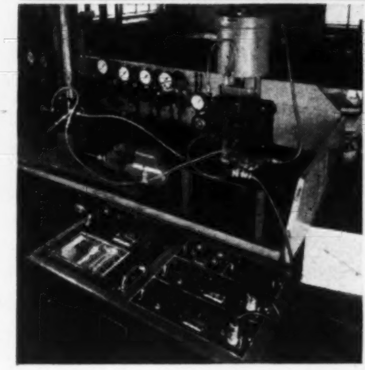


Fig. 1. Top, center, is galvanized six-inch line as it comes from power-house compressed-air receiver. It is jointed into four- and six-inch lines, left and right, for tunnel trip to foundry and manufacturing areas, respectively.

. . . from lathe cutting forces to telemetered aircraft data . . .

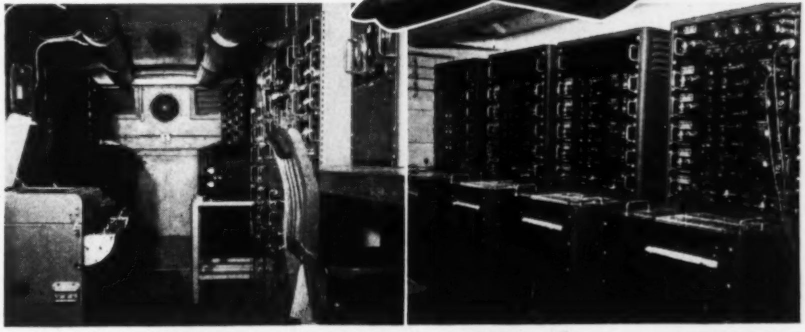
SANBORN Oscillographic RECORDING SYSTEMS prove their versatility

At the Mass. Institute of Technology Machine Tool Laboratory the effect of variables such as cutting fluid, tool geometry, speed and feeds, and tool material are measured and recorded, using a dynamometer and Sanborn two-channel System. Such records for various lathe operations, as well as many other cutting operations, provide valuable insight into the whole metal cutting process.



At Moore Products input and response of their Valve Positioner, a pneumatic instrument widely used on diaphragm top-work valves and power cylinders, are recorded on a Sanborn two-channel System. Impulses from a pneumatic sine wave generator, of frequencies as high as 20 cps, are fed through a transducer to one channel, with valve stem response recorded by the second channel from a strain gage pickup.

CONVAIR
YF-102A



At Edwards Air Force Base, California, this U. S. Air Force telemetering van received and recorded information transmitted from various pickups and transducers in the new delta wing Convair YF-102A during flight. Photos of van interior show eight Sanborn four-channel recording systems in rear, and close-up of four of the systems. Thus equipped, the van could receive data which would affect the design and performance of the YF-102A, a faster-than-sound, all-weather interceptor built by the Convair Division of General Dynamics Corporation.

These typical two- to 32-channel applications of Sanborn oscillographic recording systems give an indication of the tremendous scope of this versatile equipment. Elsewhere, Sanborn 1-, 2-, 4-, 6- and 8-channel systems and components are used in meteorological research . . . quality control programs . . . instrument and machinery field testing.

Flexibility of Sanborn design permits interchangeable amplifiers and preamplifiers to meet *individual* recording requirements with greater over-all efficiency and economy. Other Sanborn features include *inkless* recording in true rectangular coordinates, high torque galvanometer movement, time and code marking, and numerous chart speeds.

CATALOG AND TECHNICAL DATA AVAILABLE ON REQUEST

SANBORN COMPANY

INDUSTRIAL DIVISION
CAMBRIDGE 39, MASS.

For more information circle **24** on inquiry card.

798
MODEL 1301

BORG MICRODIAL

DIRECT READING THROUGH 3600° TO A DIGITAL ACCURACY OF 1 PART IN 1000.

FITS ANY MULTI-TURN DEVICE HAND OR SERVO OPERATED

● The new direct reading Borg Microdial Model 1301 practically eliminates human error because it was designed for forced fast reading. Laboratory, production and processing controls become more accurate when clear, sharp, figures on the specially designed Borg Counter are observed through the focal-point window. Borg Counter figures are seen against a dull black background to provide maximum contrast for instant perception under difficult reading conditions.

The specially designed Borg Counter in the Model 1301 Borg Microdial reads from 000 to 999 to 000 in 3600 degrees of continuous rotation with no stops. Maximum recommended operating speed is 10,000 counts per minute (100 rpm).

Designed for military application, it has a built-in dust shield and clear-vision, wide-angle window for accurate reading from almost any position in front of the dial.

The Model 1301 Borg Microdial is compact. It measures only 1-3/4" in diameter and 1-5/8" in height and occupies no more panel space than the Micropot it controls.

WRITE FOR CATALOG SHEET BED-A31

BORG EQUIPMENT DIVISION
THE GEORGE W. BORG CORPORATION
JANESVILLE, WISCONSIN

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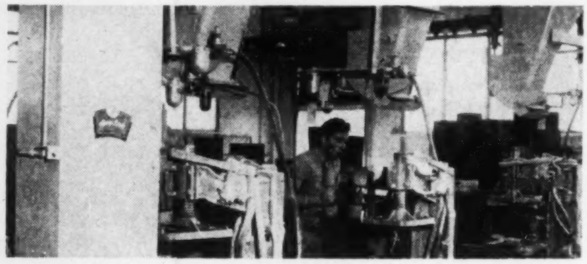


Fig. 2. Modern "handy sandy" equipment for production of non-ferrous castings at rate of about 2,000,000 pounds yearly.

upon compressed air power—from the "handy sandy" machines in the non-ferrous foundry (Fig. 2) to the skillful spray enameling of "silver luster" products prior to packaging and shipment.

The compressor is a horizontal double-acting reciprocating machine, 650-cfm capacity, capable of maintaining 100-psi line pressure throughout the manufacturing area. It was installed, along with appropriate aftercooler, separator, and receiver, in one corner of the compact new power house.

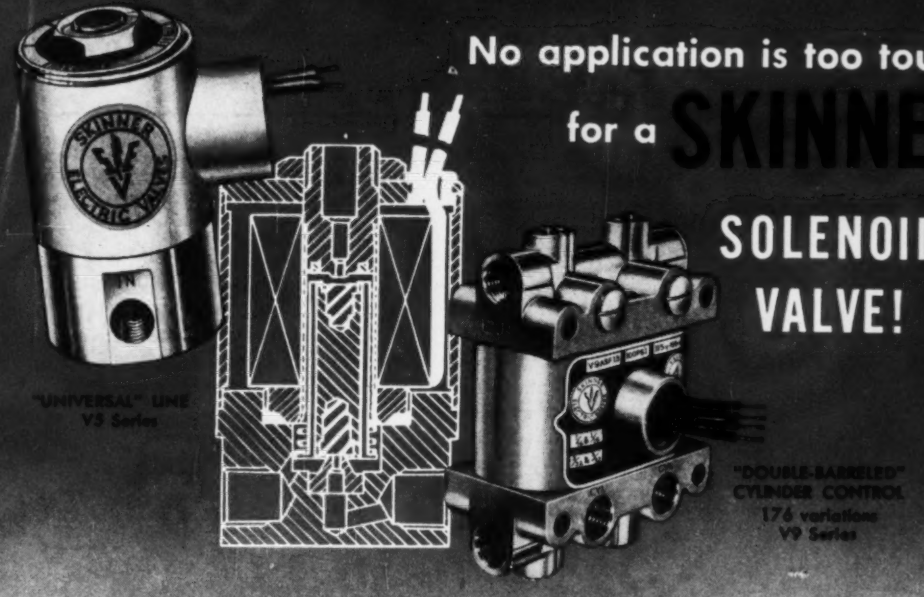
From the power house, four- and six-inch lines pass through a tunnel and short distance to the foundry and manufacturing areas respectively. After entering the factory, the six-inch line includes a Y fitting from which stems a four-inch line for presently operating facilities, and a four-inch capped piece, from which air will be distributed to the remaining manufacturing areas upon completion (Fig. 1).

Photos and Data by courtesy Compressed Air and Gas Institute, 1410 Terminal Tower, Cleveland 13, Ohio.

World's Fastest Camera

MIDDLESEX, ENGLAND.—This British camera, designed and manufactured for the U.S. Government by Winston Electronics, Ltd., Hampton Hill, Middlesex, England, will be used at Aberdeen Proving Grounds. It

No application is too tough for a SKINNER SOLENOID VALVE!


"UNIVERSAL" LINE
V5 Series

"DOUBLE-BARRELED" CYLINDER CONTROL
176 variations
V9 Series

These compact, rugged valves perform millions of cycles ...in countless applications

The V5 and the V9 are typical of the high-quality, small size valves which Skinner offers for general service applications. Both give fast, dependable operation and positive performance. Both are direct-acting, spring loaded, *leakproof*. And both of them are sturdily constructed . . . to give maximum service through long, severe use.

V5 - "Universal" Line

UL-approved — suitable for all common media on pressure or vacuum. Available in a broad selection of types, electrical outlets, port locations and sizes, flow adjustments and coil types. Also available with UL-approved Explosion-Proof construction and with "Quick Exhaust" for extra-fast cylinder return. *Simple to inspect* — can be disassembled without removal from the line.

Specifications: Type — 2- or 3-way, normally open or normally closed, or directional control. Pressure rating — 0-1000 p.s.i. Vacuum to 5 microns.

V9 - "All Purpose" Four-Way

For precision control of double-acting cylinders or two single-acting cylinders . . . at speeds up to 600 cycles per minute! Available with 176 variations of types, capacities and adjustable flow arrangements. Can be used with air, hydraulic, oils and other common media. Die-cast zinc bodies.

Specifications: Type — normally open, normally closed, or combination — normally open and normally closed. Pressure rating — 0-150 p.s.i. Vacuum to 5 microns.

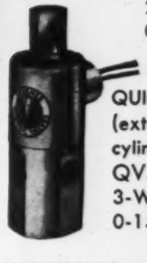
**Do you have a solenoid valve problem?
Call in a specially trained Skinner resident engineer — he'll tackle your problem immediately.**

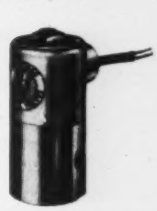
World-Wide Representation — Immediate Delivery on Standard Valves

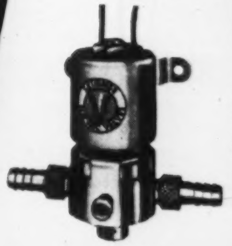
SKINNER SOLENOID VALVES

GENERAL SERVICE & VACUUM
V5 Series
2- & 3-Way
0-1000 p.s.i.

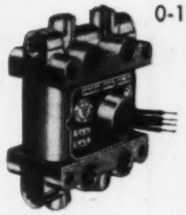
MINIATURE CUT-OFF
V2 Series
2-Way
0-250 p.s.i.

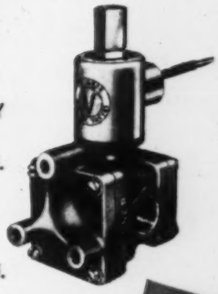

QUICK EXHAUST
(extra fast cylinder return)
QV5-3 Series
3-Way
0-150 p.s.i.


HI-PRESSURE HYDRAULIC
V10 Series
2- & 3-Way
0-1000 p.s.i.


SANITARY
V4 Series
2-Way
0-20 p.s.i.

EXPLOSION-PROOF
X5 Series
2- & 3-Way
0-1000 p.s.i.


ALL-PURPOSE FOUR-WAY
V9 Series
4-Way 0-150 p.s.i.


HI-FLOW INDUSTRIAL
M Series
2- & 3-Way 5-150 p.s.i.

SKINNER ELECTRIC VALVE DIV.
The Skinner Chuck Company
116 Edgewood Avenue, New Britain, Conn.

☐ Please send me your new General Catalog.

☐ Please have a Skinner representative call on

Date..
Name..
Company..
Street..
City.................... Zone.... State..............

® THE CREST OF QUALITY

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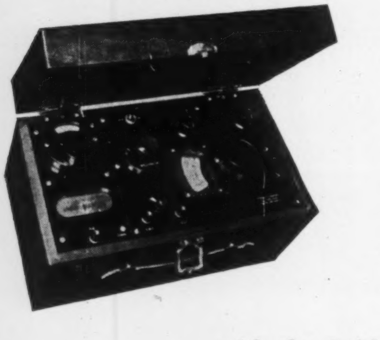
Precise
TEMPERATURE MEASUREMENTS

. . . with the Rubicon
MUELLER BRIDGE

A highly accurate and specialized form of the Wheatstone bridge designed expressly for precise resistance thermometry with three- or four-lead thermometers and for the measurement of other similar resistors within its range.

- Wide range: 0 to 141.1110 ohms in increments of 0.0001 ohm
- Unity ratio with provision for convenient checking and precise adjustment of ratio arms
- Built-in mercury commutator for lead resistance compensation
- Sub-panel switch construction
- Built-in plug and block assembly for conveniently checking ratio, bridge zero and thermometer resistance with no disturbance of external bridge connections

Described in Bulletin 100



. . . with the Rubicon
PORTABLE PRECISION POTENTIOMETER

A two-dial instrument of exceptional accuracy and sensitivity.

- High-sensitivity, sturdy, built-in Pointerlite galvanometer—permits balancing to within 2 microvolts in low resistance circuits
- Completely self-contained assembly—no external accessories except the thermocouple circuit
- Two ranges —0 to 16.1 and 0 to 161 millivolts—readable to within 2 and 20 microvolts respectively
- Sturdy, compact construction for long dependable service

Described in Bulletin 270

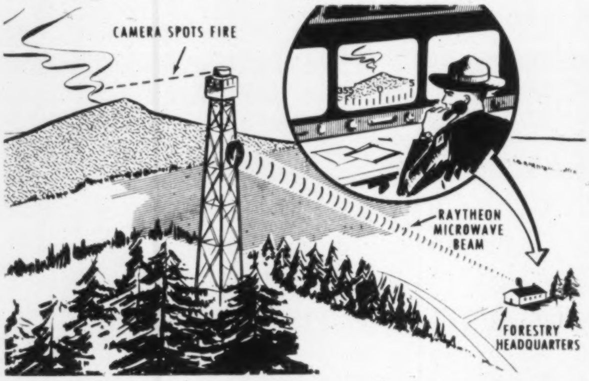
RUBICON COMPANY
Electrical Instrument Makers
3755 Ridge Avenue Philadelphia 32, Pa.

For more information circle **27** on inquiry card.

can take six photographs at a time, of 0.1-microsecond exposure, at 2-microsecond intervals. The technicians are shown at work on the camera part of the sequential image converter.

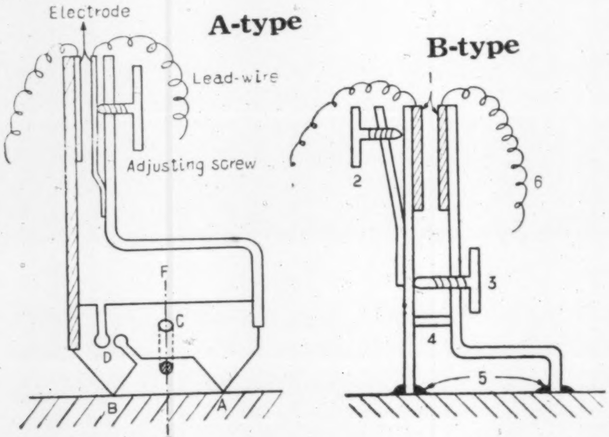
Automatic Firewatch

CHARLESTON, S. C.—Demonstrated at the convention of the Forestry Conservation Communications Association at Fort Sumter Hotel, Charleston, was the automatic firewatch system of Raytheon Mfg. Co. TV cameras in tower posts rotate continuously or may be controlled remotely. Pictures are transmitted by microwave to forestry headquarters. All operation, including remote control of camera is by microwave.



Capacitance-type Strain Gage

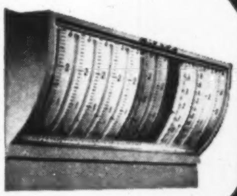
TOKYO, JAPAN.—A new strain meter using capacitance change is reported from the University of Tokyo by K. Ikeda and B. Tomita. Main advantage over resistance-wire strain-gage instruments is simpler temperature compensation and greater convenience in moving from point to point.



Two types are used. "Type A" uses steel fabricated plate whose knife edges rest on member to be tested. "Type B" gage is light in weight and is attached to specimen by cement. In both types, change in spacing between contact points is converted into change in separation of capacitor plates.

Conventional circuitry is used to convert capacitance into strain units.

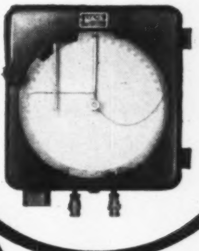
one of these Hays gages will meet your LOW PRESSURE requirements



W-Gage for large boilers and remote indication

B-Gage for small boilers, combustion testing and air filters

FOT-Gage for furnace pressure or fuel flow – air flow indication



OT-Recorder for draft or pressure

D-Gage for commercial, institutional boilers and industrial furnaces

Whether you need a draft gage for the largest steam generator, or a small portable gage for spot checking pressure conditions, first or last, it will pay you to talk to Hays, manufacturer of the most complete line of draft and low pressure gages.

Functional in styling, Hays gages have the features instrument men have always asked for—easy to read, accessible and extremely dependable.

The heart of all Hays low pressure gages is a diaphragm housed in cast metal. Diaphragms are easily replaceable in the field.

All Hays gages are guaranteed to withstand at least 100% over range without failure!

Why not talk to the people at Hays about low pressure gages for your applications—or write for complete details: *Bulletin 54-667-8.*

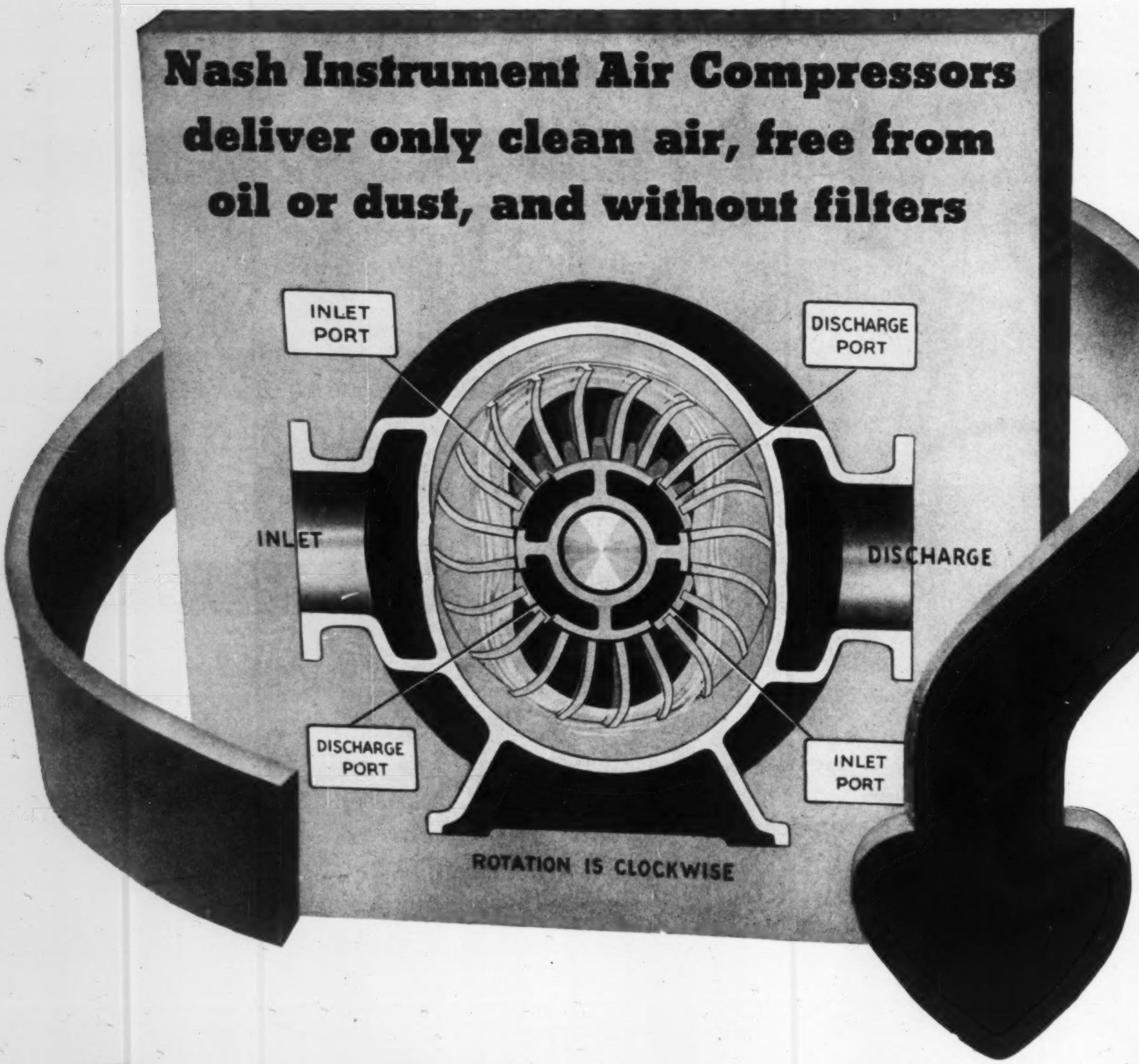
Automatic Combustion Control
Boiler Panels • CO_2 Recorders
Veriflow Meters and Veritrol
Gas Analyzers • Draft Gages
Combustion Test Sets
Electronic Oxygen Recorders
Electronic Flowmeters
Electronic Feed Water Controls
Miniature Remote Indicators

THE hays CORPORATION

MICHIGAN CITY 8, INDIANA

For more information circle **28** on inquiry card.

Nash Instrument Air Compressors deliver only clean air, free from oil or dust, and without filters



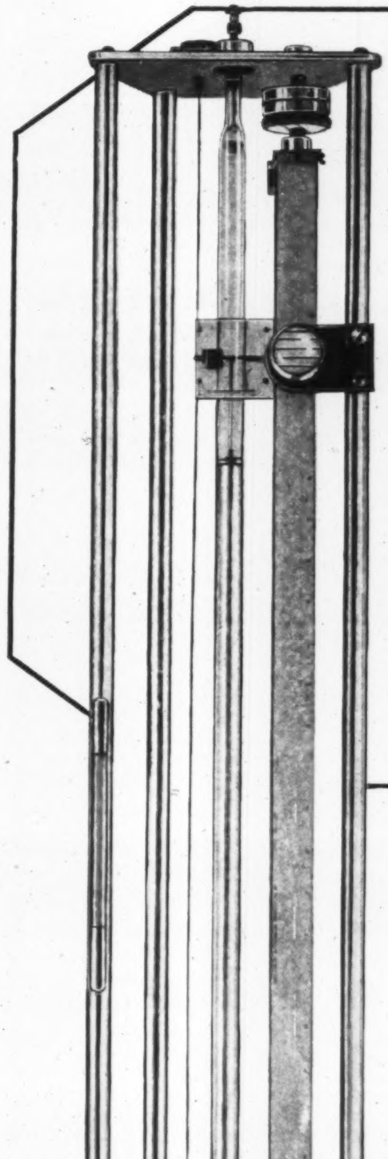
Here is Why!

You can dispense with oil filters and dust filters when you install ®Nash® Clean Air Compressors. You can save the cost of maintaining these devices. You can greatly reduce instrument maintenance costs. For the Nash employs no internal lubrication, therefore no troublesome oil is in the delivered air. Moreover, air from a Nash is thoroughly washed and cooled as it passes thru the pump. Dust in the plant atmosphere, even fly ash, is immediately removed.

®Nash® Clean Air Compressors are simple, with only one moving element. No valves, gears, pistons, sliding vanes, or other enemies of long life and constant performance complicate a Nash. No aftercoolers are needed. You will find it profitable to investigate these pumps, now.

No oil filters.
No dust filters.
No internal lubrication to contaminate air handled.
No internal wearing parts.
No valves, pistons, or vanes.
Non-pulsating pressure.
Original performance constant over a long pump life.
Low maintenance cost.

NASH ENGINEERING COMPANY
370 WILSON, SO. NORWALK, CONN.



MERCURIAL-PRECISION STANDARD

Type FA-187

Measures Absolute or Differential Pressure

Used interchangeably as a Barometer or Differential Pressure Manometer.

Range: 0 to 800 mm of Hg.
0 to 31.5 in Hg. or in any other desired pressure unit of equivalent range.

The magnetic vernier reads to 0.01 mm or 0.005 in. of mercury with an accuracy of 1 part in 5000 over the full range.

For additional information,
write for Publication Number TP-32-A.

WALLACE & TIERNAN
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A-103

For more information circle **29** on inquiry card.

POSITIVE DISPLACEMENT

NO STUFFING BOX

Specify Lapp Auto-pneumatic PULSAFEEDER

. . . for Automatically Controlled Metering of Liquids

The outstanding features of the Lapp "Auto-Pneumatic" Pulsafeeder make possible continuous automatic processing of liquids which cannot be satisfactorily handled by plunger-type metering pumps. The "Auto-Pneumatic" Pulsafeeder is a piston-diaphragm pump providing positive displacement without the problems of a stuffing box. A hydraulically balanced Pulsafeeder diaphragm isolates the product from the working parts of the pump, preventing product leakage or contamination. With pneumatic instrument control, the pumping rate of the "Auto-Pneumatic" Pulsafeeder automatically adjusts from zero to full capacity. Manually adjustable models also available.

WRITE FOR BULLETIN 440 *with typical applications, flow charts, description and specifications of models of various capacities and constructions. Inquiry Data Sheet included from which we can make specific engineering recommendation for your processing requirement. Write Lapp Insulator Co., Inc., Process Equipment Division, 510 Wilson Street, Le Roy, New York.*

Lapp

For more information circle **30** on inquiry card.

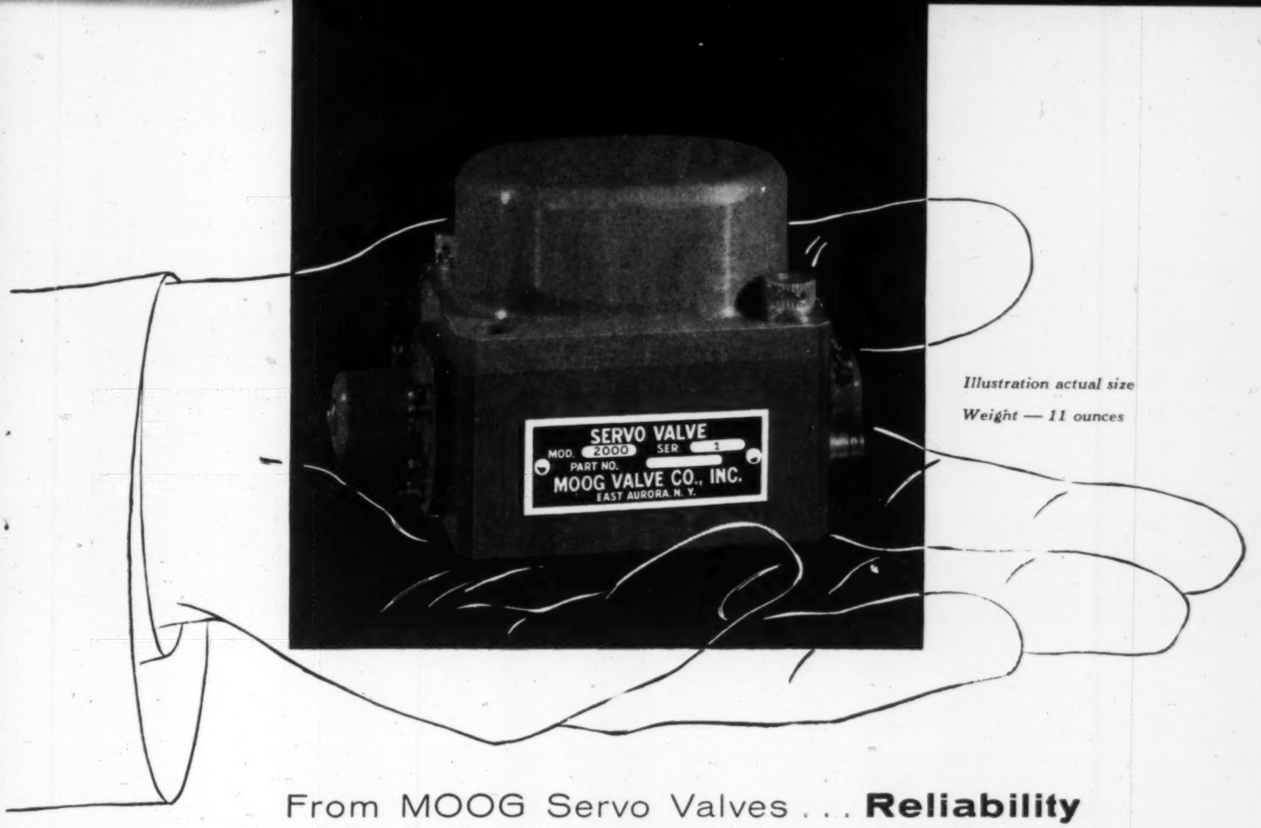


Illustration actual size

Weight — 11 ounces

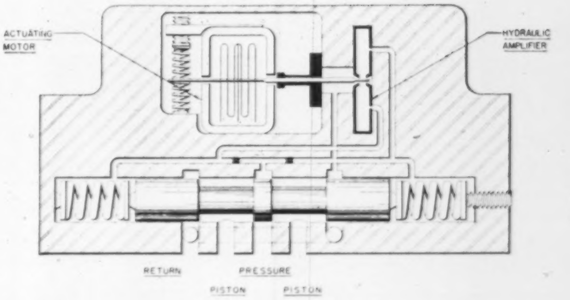
From MOOG Servo Valves . . . **Reliability and High Dynamic Performance**

Many thousands of Moog Servo Valves are now in use in exacting applications on advanced aircraft and guided missiles. This widespread usage attests to Moog features of reliability and high performance which have gained for these units recognition as the industry standard.

Now, these same features may be obtained in Moog's new Dry Solenoid Servo Valves. These units, illustrated above by Model 2000, feature a torque motor that is isolated from contact with the hydraulic fluid. The Dry Solenoids have been developed for those systems in which the fluid might otherwise contaminate the torque motor. They are even smaller and lighter than other Moog units of the same flow capacity and comply with requirements of MIL-H-5440A.

Moog Servo Valves are proportional type, electrically actuated, hydraulic, four-way valves featuring high dynamic response, sensitivity, linearity, small size and low weight. Production models are designed to operate in hydraulic systems of from 1000 to 3000 PSI pressure. Rated output flows from 0.1 to 50.0 GPM for control currents between 2.0 and 40.0 milliamperes as specified are available in production units.

Conventionally, valve input is from a balanced push-pull DC amplifier and valve flow output is applied to a piston or hydraulic motor. An electric signal proportional to piston position or motor angular rotation is fed back to the amplifier to give a closed servo loop.

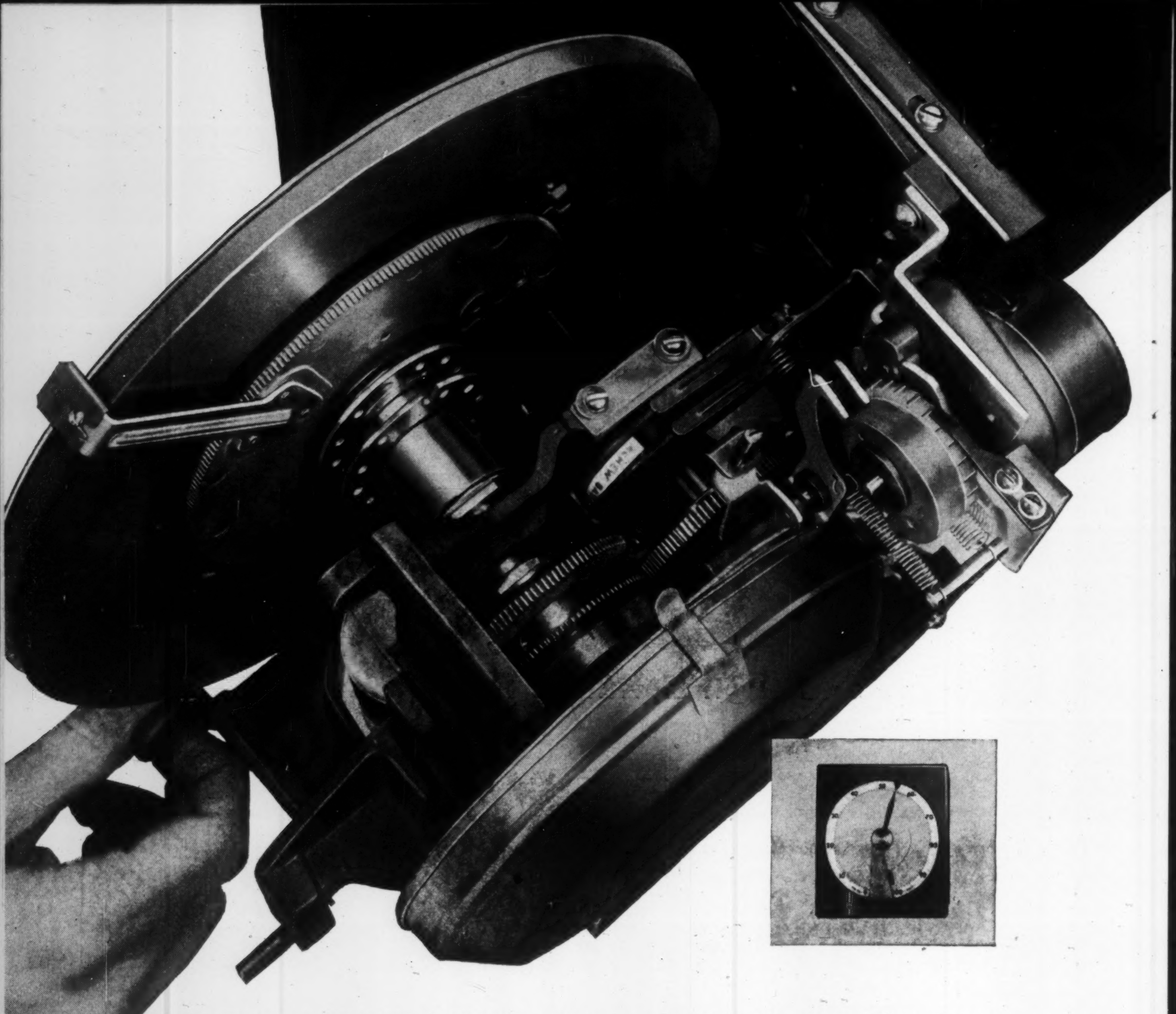


MOOG

For details write for Bulletin 2000-3

MOOG VALVE CO., INC. PRONER AIRPORT EAST AURORA, N. Y.

For more information circle **31** on inquiry card.



A new concept in instrument simplicity for

on-the-job economy

WITH SPEEDOMAX® H

● When you see these null-balance potentiometer temperature instruments you'll know what we mean. Their simplicity of design will reflect in point-of-application savings to you . . . in initial cost, ease of installation and during year-in year-out service.

You'll see they have few moving parts . . . all readily accessible; compact, simplified construction; neat, well-marked wiring. But you'll notice they still retain the advantage-proved L&N direct drive . . . one straight-through shaft carries pointer, pen, control cams and slidewire . . . moves them in permanent alignment.

And you'll find they can be installed in any convenient location . . . quickly and economically.

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instruments *automatic controls • furnaces*

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Editorial...

INSTRUMENTS and AUTOMATION

Analytical-Balance Modification Results in Recording Microbalance

—a first disclosure on a new development with revolutionary implications for the entire field of analytical chemistry.

THE basic instrument for research in analytical and physical chemistry is the analytical balance. The conventional laboratory analytical balance provides the researcher with a sensitivity in the order of 10 milligrams per inch of pointer deflection. To attain higher sensitivities, to make weighings of less than a milligram, the researcher has had to resort to delicate and fragile instruments, to complex instrumentation, and to refined and painstaking technique.

A postage stamp weighs 60 milligrams; no weighing problem is posed in this range. One inch of human hair weighs about 100 micrograms, or 0.1 milligram; the conventional balance can barely be used in this range. A single molecular layer of water weighs about 0.03 microgram per square centimeter of area; this is far beyond the sensitivity limitation of the conventional balance. Imagine, if you will, the fundamental analytical experiments that await the penetration of the sensitivity barrier of the conventional analytical balance—weighings in the fractional microgram region bring the researcher within the molecular region and permit frontal attack on chemical behavior!

In this issue* there is disclosed a development by Dr. Axel Peterson (of Mellon Institute of Industrial Research) that converts almost any standard laboratory analytical balance into a recording microbalance with a sensitivity gain of 10,000, permitting comparative measurements in the order of 0.1 to 0.01 microgram—and by use of only standard, available, inexpensive equipment.

Merely to state that a sensitivity in the order of 0.1 to 0.01 microgram is available from a conventional milligram-sensitivity analytical balance is so startling that many will react incredulously and ask for immediate proof that it is the weight that is being detected—this reaction is a logical corollary to so revolutionary a disclosure. But Figure 3 of this paper shows a stable recording made on a mass of 100 grams, with balance sensitivity of 0.1 microgram per scale division. The line width of the recording represents about 0.01 microgram—and the oscillation in the recording shows not only complete absence of bearing friction, but a recording sensitivity in the order of the line width. Hence we feel justified in making the statement that microbalance performance now can be obtained from almost any laboratory analytical balance, with sensitivity in the order of 0.1 to 0.01 microgram, representing a maximum resolution of 1 part in 10^{10} in a 100-gram sample.

Some comment is called for on the subject of sensitivity versus accuracy. The sensitivity reported is of the order of 0.01 to 0.1 microgram; the accuracy, or repeatability for absolute measurement, is about 1 microgram for a well-adjusted balance. Both accuracy and sensitivity are important, but sensitivity is the factor needed for a host of rate-of-change weighings which are fundamental to that entire area of analytical research involving reaction rate, absorption, evaporation, etc. Thus the attainment of a sensitivity of up to 0.01 microgram, representing a resolution of 1 part in 10^{10} in a 100-gram sample, prepares the way for a new philosophy in analytical research, a truly revolutionary development.

This sensitivity, remarkable as it is, is not the limit possible. The gain of 10,000 in balance sensitivity resulted primarily from use of a standard differential transformer excited by 60-cycle power. The key to the solution was the reduction in excitation voltage to 0.7 volt, and effective demodulation technique. But use of special-design transformers excited at higher frequency and still lower voltage might lead to even higher sensitivity, as ~~would~~ greater electronic amplification, special modulation technique, etc.

It is quite true that sensitivities and accuracies of the same order have been reported in the literature. (Readers of I&A may recall Editor Behar's comments before World War II, on Dr. Müller's electronic balance at New York University, and Dr. Gulbransen's quartz-fiber microbalance at the Westinghouse Research Laboratories, both "record breakers.") But microbalances reported have been fragile instruments to which the addition of a postage stamp might break the beam; nor have they had the resolution reported by Peterson. The developments of Caule and McCully likewise were based on the inductive approach, but they do not report microbalance sensitivity. Mauer at the National Bureau of Standards used photocell-mirror techniques, as did Müller in 1938.

To our knowledge, this development by Peterson is the first to offer *recording microbalance sensitivity* from conventional analytical balances, and at such high resolutions. We are proud to publish the first disclosure of this unique development with so many implications for the entire field of analytical research.

Milton H. Aronson

**See pages 1104-1106*

New Instruments...

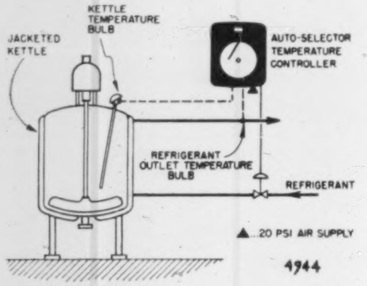
For further information use the postage-free order card on page 1163

INSTRUMENTS and AUTOMATION

PROCESS CONTROL and MONITORING

Polymerizing Controller

New control system solves problems of both freeze-up and overheating of refrigerant-cooled batch kettles in cold polymerizing of rubber and plastics; is recommended where reaction is not highly exothermic; uses a selective ("Auto-Selector") controller instead of conventional single-action instrument.—*The Foxboro Co., Foxboro, Mass.*



For more information circle **201** on inquiry card.

Reactor Control System

New complete control system for "swimming pool" type nuclear reactor, reported to be the first "package" system ever fabricated for a nuclear reactor, is mounted on a bridge across "swimming pool"; will control neutron flux density by automatically adjusting control rods within active lattice containing reactor's enriched uranium fuel elements. All process variables will be charted by "Speedomax" recorders. In addition to automatic regulation, control system incorporates suitable safety and interlock circuits to assure safe operation of reactor under all conditions. Such safety systems have received approval from AEC's Advisory Committee on Reactor Safeguards.—*Leeds & Northrup Co.*, 444 *N.* 16*th St., Philadelphia* 30, *Pa.*

For more information circle **202** on inquiry card.

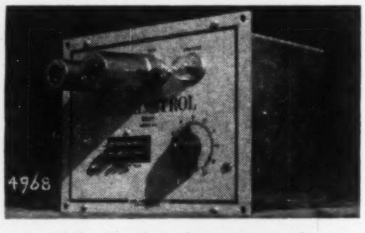
24-element Monitor

"Model 20 Dynamic Visual Monitor" combines 24 moving-spot light-beam galvanometers; weighs less than 13.5 lbs; permits simultaneous display on a 3x4-in. screen of 24 electrical signals: outputs of thermocouples, pressure pickups, etc. Spot intensity is sufficient for photography or for viewing in bright light.—*Century Geophysical Corp.*, 1333 *No. Utica, Tulsa, Okla.*

For more information circle **203** on inquiry card.

Proximity-relay System

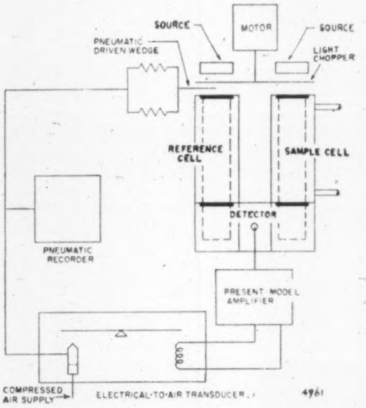
New "Proximitrol" system is designed for control of industrial processing or fabricating operations; features pickups that impose no drag on primary measuring elements; provides triggering or on-off action; operates from 110-v.ac. source. Repetitive accuracy is 0.0001 in; response 0.05 second; power at pickup 0.069 microwatt.—*Paul Morrow Co., Inc., P. O. Box* 1701, *Wilmington, Del.*



For more information circle **204** on inquiry card.

Plant Stream Analyzer

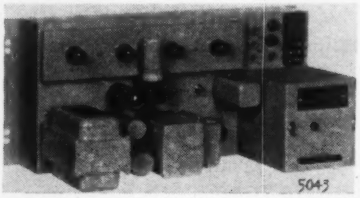
New modification of maker's standard "Model 21" infrared analyzer provides a direct pneumatic signal of high accuracy to operate indicators, recorders, or controllers; meets safety requirements where electronic instrument is not permitted.—*Liston-Becker Instrument Co., Inc.*, 649 *Hope St., Springdale, Conn.*



For more information circle **205** on inquiry card.

Telemeter Transmitter

New "TF-8 frequency transmitter, for telemetering of measurables which can be converted to a dc signal, converts millivolts from thermocouples, etc. into a 6-to-27-cps frequency; is well suited for operation over wire-line, audio-tone, carrier-current and microwave channels. Over-all accuracy better than 1% under standard reference conditions; over-all system response speed better than 1 sec ranging from 0 to 99% of full-scale.—*Instrument Dep't, General Electric Co., West Lynn* 3, *Mass.*



For more information circle **206** on inquiry card.

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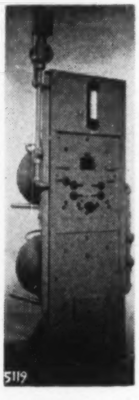
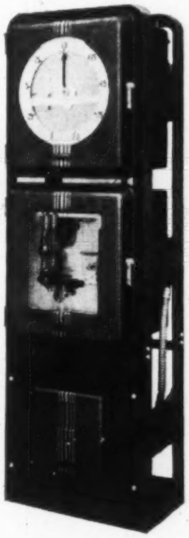
Plant Stream Analyzer



New "Models 38-101 and 38-102" are production models of automatic infrared analyzer reported in these columns last year as available from Instrument Sales Div. of Phillips Petroleum Co. This analyzer is one of four plant-control instruments developed and pilot-produced by Phillips Petroleum Co. which now are made by undersigned. "38-101" samples one to five process streams automatically; "38-102" is for single-stream analysis and control. Continuous readings from stream being sampled can be telemetered for remote recording.—*Consolidated Engineering Co., Pasadena 15, Calif.*

For more information circle **207** on inquiry card.

Residual Chlorine Analyzer



New continuous analyzer for free residual chlorine provides an automatic check on Cl_2 content in chlorinated water; functions on coulometric principle; incorporates maker's "Speedomax" recorder.—*Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.*

Circle **208** on inquiry card.

Process Refractometer

New refractometer (one of four plant-type analytical instruments acquired by CEC from Phillips Petroleum Co.) monitors continuously refractive index of liquid process streams; makes possible automatic control of liquid-stream blending, fractionating-tower operation, etc., by a telemetering circuit for strip- or circular-chart recording, or direct control. Sensitivities of 0.000012 R.I.

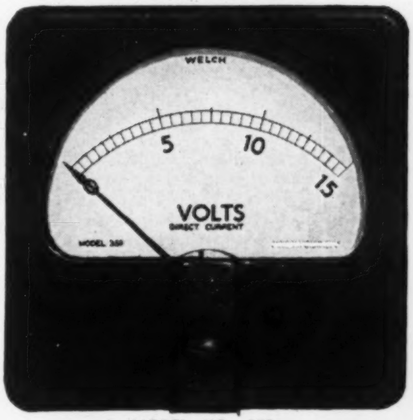
20 MICROAMPERES D.C. PANEL METERS

W. M. WELCH SCIENTIFIC CO.
CHICAGO, ILL.
5
10
15
20
MICROAMPERES
DIRECT CURRENT
MODEL 350

MODEL NO. 350

Welch Model 350 Panel Meters are often used in temporary "bread-board" assemblies and in "homemade" devices so common in electronics laboratories. In such work it is frequently more convenient to have an attached rather than a separate meter.

Suitable for such applications as measuring grid currents and currents from photoelectric tubes and cells. They have alnico magnets, sapphire bearings, and especially selected pivots to make possible the extremely sensitive 20 microampere movement.



MODEL NO. 351

• Accuracy 2% of full scale deflection

These precision instruments are expertly designed, highly sensitive, sturdily built and adapted for work requiring the most rugged performance.

- **Stable and Well-Damped**
- **Flush Mounting Bakelite Cases**
- **High Torque Ratio**

MODELS

350—3½ inch round—2.4 inch scale
351—3 inch square—2.4 inch scale
451—4½ inch rectangular—3.5 inch scale

0
.2
.4
.6
.8
1.0
MILLIAMPERES
DIRECT CURRENT
MODEL 451
WELCH

MODEL NO. 451

TYPES

- Microammeters 0-20 up to 0-500
- Milliammeters 0-1 up to 0-500
- Ammeters 0-1 up to 0-30
- Voltmeters, various ranges, 100 to 50,000 ohms per volt
- Zero Center Ammeters
- DB Meters
- Rectifier Instruments
- Thermocouple Meters
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A complete line of round, square, and rectangular meters is manufactured by Welch.

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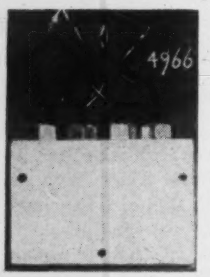
Manufacturers of Scientific Instruments and Laboratory Apparatus

For more information circle **33** on inquiry card.

units per division down to 0.0024 R.I. units per division are available. Temperature and pressure variations are compensated automatically by maintaining standard and sample at the same conditions.—*Consolidated Engineering Corp., Pasadena* 15, *Calif.*

For more information circle **209** on inquiry card.

Gas Analysis Cell



New gas analysis cell is said to be "a universal gas analysis unit that can solve a variety of gas analysis problems"; features rapid response; can be used with indicators or recorders of direct-deflection or potentiometer type. —*Mira Scientific Instruments*, 2656 *N. Pasadena Ave., Los Angeles* 31, *Calif.*

For more information circle **210** on inquiry card.

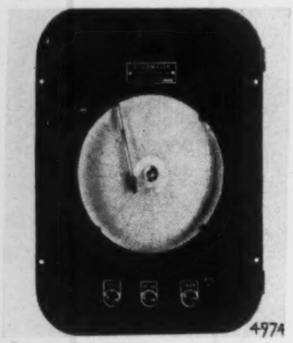
Electric-contact-type Automatic Controller

New "Model 331 Displacement Controller" for differential transformer pick-ups makes possible alarm or automatic control systems for pressure, weight, stress, motion, etc.; supplies regulated excitation voltage for pick-up; has both electrical zero and sensitivity adjustments. Relay contacts are rated at 5 amp. 250 v.ac. Maximum full-scale sensitivity is 0-0.02 in. using typical differential transformer or 0-5 lbs. using maker's "Series 140 Load Transducers."—*Daytronic Corp.*, 216 *S. Main St., Dayton* 2, *Ohio.*

For more information circle **211** on inquiry card.

Starch-sizing Controller

New systems for automatically controlling starch cooking use a "Viscometer" to accurately finish each batch to the same viscosity. Recorder-controller illustrated automatically controls complete starch-cooking operations.—*Norcross Corp., Dept. N45, Newton* 58, *Mass.*



For more information circle **212** on inquiry card.

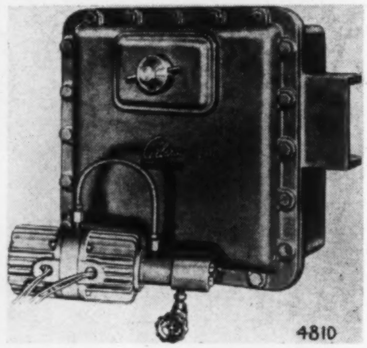
Conductivity Instruments

New models of electrolytic conductivity recorders and indicators are available in low range of 0 to one micromho; are especially useful in work with high-quality mixed-bed demineralizer effluent.—*Industrial Instruments, Inc., Cedar Grove, N. J.*

For more information circle **213** on inquiry card.

Pipe-line Sampler

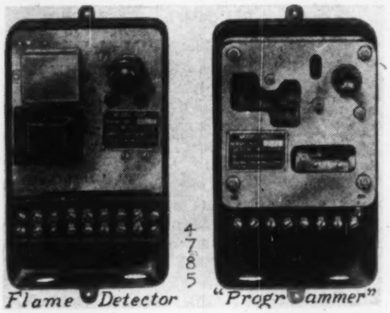
New Automatic Pipe Line Sampler extracts many minute samples (300 per minute if desired) so that composite thus accumulated is more representative than are larger samples taken at longer intervals. Can be supplied with control proportional to time or to flow. Pressures up to 350 psi. and temperatures to 200°F. can be handled by standard models. (Special models for higher pressures and 350° F.)—*Gilbert & Barker Mfg. Co., West Springfield, Mass.*



For more information circle **214** on inquiry card.

Combustion Safeguard

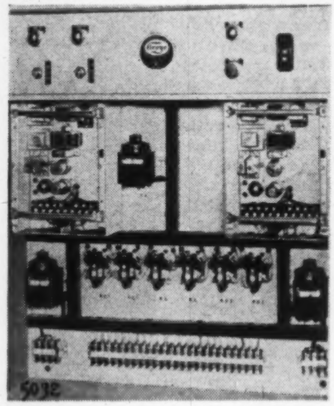
New "Twin Flame" system, for gas-fired industrial equipment, is said to "represent a significant advancement for higher standards of safety, ease of installation and lower maintenance." Feature: utilization of constant impinging flames to complete an electrical path in a voltage-responsive system, thus eliminating flame rods and photocells.—*Safety Equipment Div., Control Engineering Corp.*, 934 *Washington St., Norwood, Mass.*



For more information circle **215** on inquiry card.

Multiple-burner Flame-failure Safeguard System

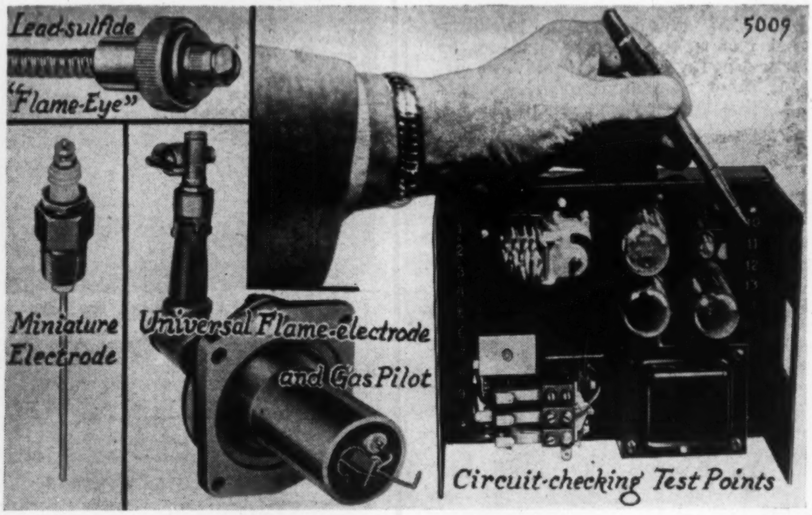
New "Fireye Integrated Control System" comprises "Control Cabinet Assembly" (illustrated) plus all controls, timers, valves and accessories necessary for a complete installation; provides starting and operating flame-failure protection for 1, 2, 3 or 4 burn-

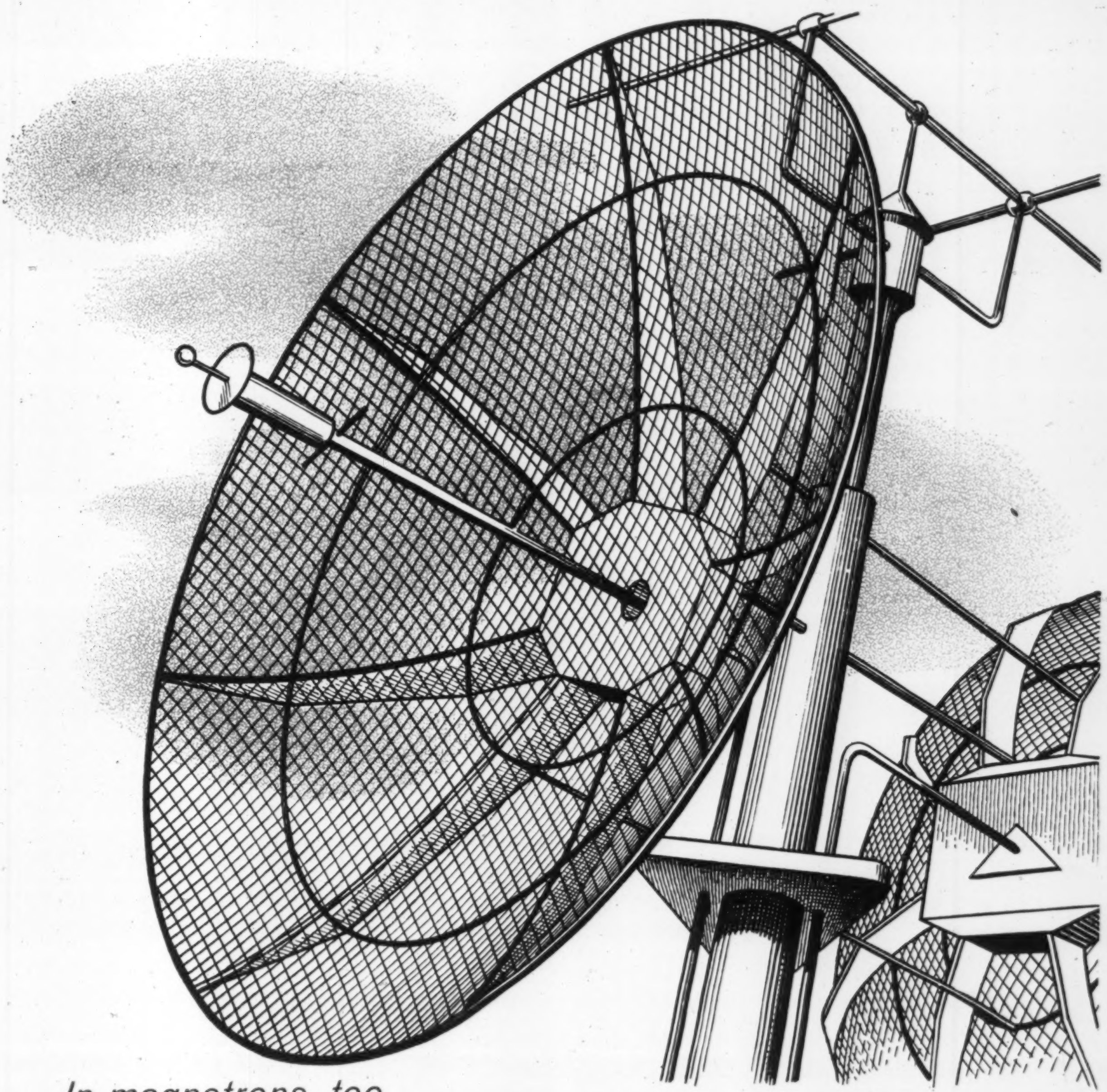


Industrial Combustion-safeguard System

New "1400" and "1500" series of maker's "Flame-otrol" system embody improvements and refinements, among them plug-in chassis with maximal accessibility. New "Control Centers" (not illustrated) house pilot lights, alarms, instruments and other components.—*Barber-Colman Co., Rockford, Ill.*

For more information circle **216** on inquiry card.


Lead-sulfide "Flame-Eye"
Miniature Electrode
Universal Flame-electrode and Gas Pilot
Circuit-checking Test Points
5009



In magnetrons, too

CRUCIBLE PERMANENT MAGNETS

provide maximum energy . . . minimum size

In designing magnetrons for radar systems – or any very high-frequency oscillator application – you can be sure of a *consistently higher* energy product with Crucible alnico magnets. *This means more power from a minimum size magnet!*

Crucible alnico permanent magnets are made to meet practically any size requirement from a fraction of an ounce to several hundred pounds. And they're sand cast, shell molded or investment cast to the exact size, shape, tolerance and finish you need.

Crucible has been one of the largest producers of permanent magnets since the development of alnico alloys. Its unsurpassed magnet experience is backed by over 50 years of fine steelmaking. That's why the best solution to magnet problems starts with a call to Crucible. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE **first name in special purpose steels**

Crucible Steel Company of America

For more information circle **34** on inquiry card.

ers: gas, oil or gas-oil fired; manually or semi-automatically ignited; does not allow main fuel valve to open until pilot flame is established; compels purge time for four air changes, then flashes a green light. A timer limits trial-for-ignition for each burner to 10 sec, after which fuel valve closes if main flame is not ignited. When a flame failure occurs at any burner during light-off or operation, alarm-horn sounds and a red alarm light for that burner flashes, remaining on until burner is restored.—*Combustion Control Div., Electronics Corp. of America, 718 Beacon St., Boston 15, Mass.*

For more information circle **217** on inquiry card.

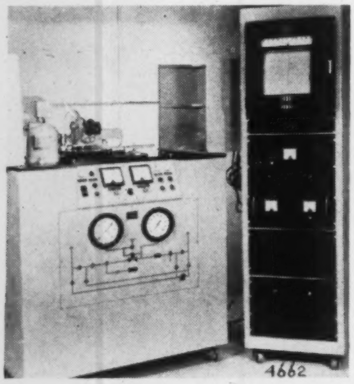
Process-control Relay

New wall-mounted "Model 600A" can have control-circuit leads hundreds of feet long if required because of sensitivity control adjustment; can be commanded by output of phototubes, etc. (less than a microamp. short circuit current) and has purely resistive impedance of control circuit. Power circuit relay is mercury plunger type, handling a 5500-watt load.—*Deltron Inc., P. O. Box 192, Glenside, Penna.*

For more information circle **218** on inquiry card.

X-ray Gas Analyzer

New x-ray absorption gas analyzer, for rapid quantitative analysis, detects elements of high atomic weight in gas mixtures and determines amounts present. Installation comprises analysis assembly (left) and circuit panel (right). Feature: monochromatic x-ray beam which permits well-defined absorption measurements said to be "consistently more accurate than results obtainable in the past."—*Research & Control Instruments Div., North American Phillips Co., Inc., 750 S. Fulton Ave., Mount Vernon, N. Y.*



For more information circle **219** on inquiry card.

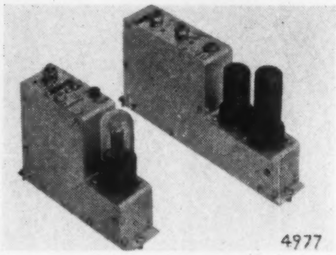
Automatic Dispatching System for Utilities

New automatic dispatching system for performing routine and repetitive functions for electric utility production departments comprises four basic "building blocks": master area console, dispatching console, master station console and turbine control console. Control system comprises remote position-repeating Selsyn circuit in which a value of incremental production cost ($/kwh) is transmitted to each machine under control. When this signal is compared with incremental cost data for each machine to specify a value of output, entire system becomes an analog computer which continuously specifies an optimum division of output among all machines. Master area controller assures that total generation is properly adjusted to match area load.—*Instrument Dep't, General Electric Co., West Lynn 3, Mass.*

For more information circle **220** on inquiry card.

Tone O&D Systems

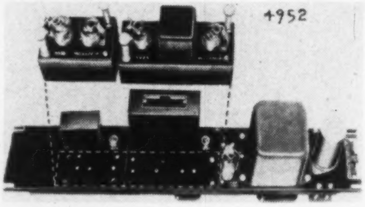
New audiofrequency tone oscillators and detectors designed for maximum stability under wide variations of voltage and temperature are made in standard plug-in assemblies; are for remote control, telemetering, and selective calling where telephone lines, radio and microwave links are used. One oscillator and its companion detector comprise a complete tone signalling channel; and a number of such pairs with different frequencies constitute a system. Available channel frequencies 500 to 6000 cps.—*Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, No. Hollywood, Calif.*



For more information circle **221** on inquiry card.

Tone Units for Remote Control and Metering

New models of "Audio-Tone Signaling Units" are available in a new package of modern modular design; enable up to 48 on-off or raise-lower functions to be controlled over a single circuit—telephone line, microwave, or VHF radio; operate in range of 425 to 6025 cps at intervals of 100 or 150 cps; are available in various combinations of transmitters and receivers including a duplex signaling unit, a dual transmitter unit, a dual receiver unit, and individual receiver and transmitter units.—*Hammarlund Mfg. Co., Inc., 460 W. 34th St., New York 1, N. Y.*



For more information circle **222** on inquiry card.

TEMPERATURE

Thermistor-compensated Thermoelectric Pyrometers

New "Models 255" (2½-in), "355" (3½-in) and "455" (4½-in) are three new sizes of sealed and ruggedized millivoltmeters, making ten case styles to choose from. "All have automatic bimetal cold junction compensation and thermistors for high accuracy over wide variations of ambient temperature."—*Assembly Products, Chesterland, Ohio.*

For more information circle **223** on inquiry card.

Multipoint Pyrometer

New multipoint pyrometric system consists of several thermocouples connected to a "Veri-Tell" high-resistance pyrometer with a selector switch. Models are available for 3 to 23 positions.—*West Instrument Corp., 525 N. Noble St., Chicago 22, Ill.*

For more information circle **224** on inquiry card.

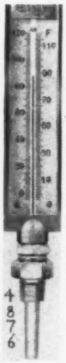
Thermocouple Packaging

New packaging for maker's "Butt Welded Thermocouples" is in form of transparent moisture-proof non-crushable plastic tubes which eliminate kinking and tangling of TCs during shipment and stocking. Complete labeling obviates need of removing contents for identification.—*Conax Corp., 7811 Sheridan Drive, Buffalo 21, N. Y.*

For more information circle **225** on inquiry card.

Industrial Thermometers

New industrial thermometers feature advanced styling employing a U-shaped extrusion instead of V-type casting; no distortion of markings and figures; removable fitted cap and U-scale seal for corrosion-resistant dust-proof rattle-proof assembly; multi-pointed tubes; individually engraved scales; calibration with NBS Certified Thermometers.—*Scientific Instrument Co., 1041 Second Ave., Detroit 26, Mich.*



For more information circle **226** on inquiry card.

Thermistor Thermometer

New "T-100 Surgical Thermometer" finds many industrial applications; features a flexible primary element of 0.2-in. diameter and 12 in. long with

Simplicity and Good Design Features in

POWERS

FLOWRITE VALVES

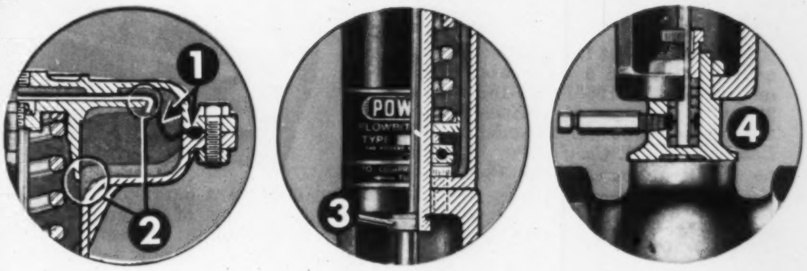
POWERS
FLOWRITE VALVE
TYPE
THE POWERS REGULATOR
TO COMPRESS SPRING TURN
(b98)

STURDY, PRACTICAL DESIGN
Strong, light weight precision cast alloy housing is corrosion resistant. Only 6 bolts saves maintenance time.

OVER 60 YEARS
of Temperature and Humidity Control.

Ball Check Lubricator with Silicone grease for temperatures 40° to 500° F.

For Pressures up to 250 PSI.



give close control and they last longer

❶ **Diaphragm** has a formed bead which provides increased sealing action with increasing control pressure. It has no bolt holes. Diaphragm lasts longer.

❷ **Piston plate assembly** has a free floating thrust plate which absorbs side thrust. Closely guided piston plate maintains valve stem in accurate alignment. High tensile strength steel spring is cadmium plated and completely enclosed.

❸ **Adjustment screw** is non-rising ball bearing type cadmium plated, easily accessible, easy to adjust.

❹ **Packing:** Deep packing space contains preformed lubricated packing readily accessible. Note lubricator.

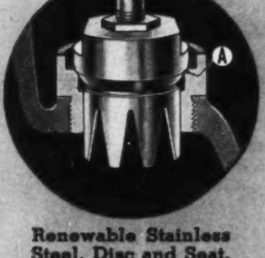
Accurate control results from smooth rolling diaphragm and minimum of valve stem friction.

Right type and size of valve is important for good control. An experienced Powers engineer will gladly help you make the right selection. Call our nearest office or write us direct.

AT NO EXTRA COST
POWERS CONTROL SYSTEMS

Include these Premium Quality Valves

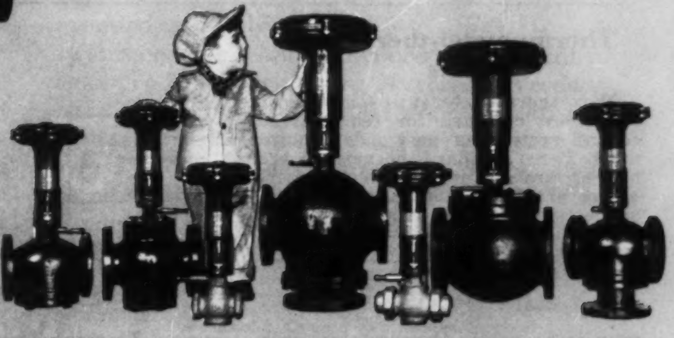
Get complete information, write for series 344 bulletins



Renewable Stainless Steel, Disc and Seat.

Compare POWERS Single Seat Valves with other high quality valves. Check their performance, tight shut off feature and sturdy construction.

Available: Composition Disc also V-Port characterized which gives straight line control. Separate shut off seat (A) reduces wire drawing, insures tight shut off.



SINGLE SEAT • DOUBLE SEAT • 3-WAY MIXING VALVES

Established 1891 **THE POWERS REGULATOR COMPANY** **Skokie, Illinois**

Offices in Chief Cities in U.S.A., Canada and Mexico, See Your Phone Book

For more information circle 35 on inquiry card.

tiny thermistor at tip, coupled through a disconnect and a 6-ft. cable. Three models, for 60-100°F, 70-105°F, and 92-106°F ranges.—*Mira Scientific Instruments*, 2656 *N. Pasadena Ave., Los Angeles* 31, *Calif.*

For more information circle **227** on inquiry card.

Thermocouple Monitor

New model of "Restorer" corrects inaccurate temperature reading and control caused by thermocouple circuit failure during heat treating and melting operations. It renews proper conductivity in TC circuits by breaking down excessive resistance caused by corroded, oil-soaked or loose circuit connections. It operates manually or automatically; and one unit checks as many TCs as is desirable and practical.—*Peerless Electric Co., Electronics Div., Warren, Ohio.*

For more information circle **228** on inquiry card.

Small Thermal Switches

New "C-4344 Series Klixon" disc-type snap-acting hermetically-sealed thermostats feature small size for applications where space and weight are limited. Snap-acting disc is located opposite terminal end at bottom of metal enclosure where temperature of air, liquids, or mounting surface can be followed. Available in preset temperature settings; differentials can be 15° and more.—*Spencer Thermostat Co., Attleboro, Mass.*

For more information circle **229** on inquiry card.

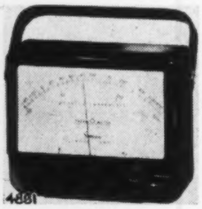
Potentiometer

New "No. 2745" is said to "incorporate for the first time in a portable thermocouple potentiometer a new and important development extending the technique of reference junction compensation to the entire range of sub-zero thermocouple measurements." Measurements above and below table reference temperature can be made without readjustment of compensator or reversal of TC leads. Measuring and compensator ranges cover all values of thermoelectric emf encountered with either base- or noble-metal TCs.—*Rubicon Co., Ridge Ave. at 35th St., Philadelphia* 32, *Pa.*

For more information circle **230** on inquiry card.

Thermoelectric Thermometer

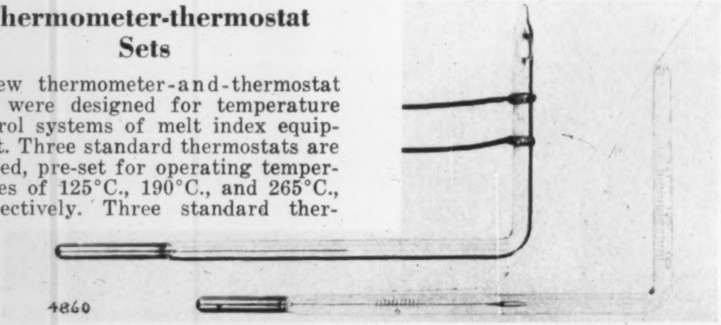
New "Model 388 Therm-O-Meter" comprises a self-shielded core-magnet millivoltmeter, a thermocouple with 7½-ft leads, and (inside instrument case) an automatic reference-junction compensating system (using a thermistor and flashlight cell) which makes possible error-free measurements of "room-range" temperatures even when room temperature itself is unknown. Instrument's range is -50°F to 1000°F on a 7-in. scale. ★"Model 388-3L" has a selector switch and provisions for attaching three thermocouples.—*Simpson Electric Co.*, 5200 *W. Kinzie St., Chicago* 44, *Ill.*



For more information circle **231** on inquiry card.

Thermometer-thermostat Sets

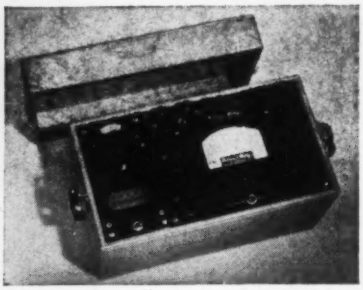
New thermometer-and-thermostat sets were designed for temperature control systems of melt index equipment. Three standard thermostats are offered, pre-set for operating temperatures of 125°C., 190°C., and 265°C., respectively. Three standard thermometers match thermostats; each comes with certificate of accuracy (±0.2°C.) both at 0°C. and at thermostat's operating temperature.—*Precision Thermometer and Instrument Company,* 1434 *Brandywine Street, Philadelphia* 30, *Pa.*



For more information circle **232** on inquiry card.

Potentiometer

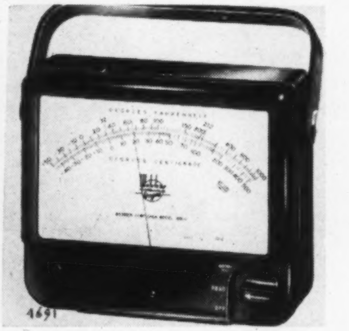
New "Portable Multi-range Millivolt Indicator" is not an ordinary millivoltmeter but a genuine potentiometer. Its seven ranges cover values from 0.25 to 25 mv. Its primary usefulness is where thermocouple and thermopile outputs must be measured rapidly and accurately. Light-spot-type galvanometer is automatically protected when instrument is off and when ranges are changed.—*Beckman & Whitley, Inc.*, 930 *E. San Carlos Ave., San Carlos, Calif.*



For more information circle **233** on inquiry card.

Thermoelectric Thermometer

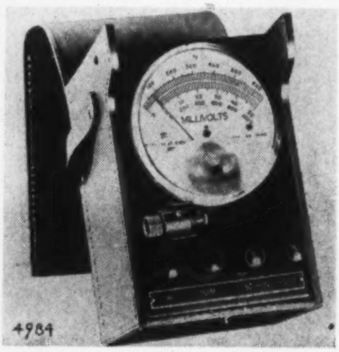
New "Model 386H Temp-Check" has unusually wide range, from −50°F to 1000°F; is supplied with a thermocouple; eliminates delays caused by waiting for gage blocks or work to return to normal temperature.—*Webber Gage Co.*, 12912 *Triskett Road, Cleveland* 11, *Ohio.*



For more information circle **234** on inquiry card.

Pyrometric Millivoltmeter

New "Model 32-JP-4-MV," for convenient checking of millivoltage output of thermocouples in both open and



Quick Lever Reset

Saves Time— Speeds Work

Added Evidence that—

Everyone Can Count on VEEDER-ROOT

Where time consumed in resetting is at a premium . . . on short machine-runs, inspection, military equipment and other applications . . . this new time-tested Quick-Reset Ratchet Counter is exactly the time-saving device you need. Just depress the easy-acting lever on the right side through 45° . . . *all 4 figures reset instantly to zeros.* And a thumb-lever may be used on the left side also if the counter is to be operated manually.

This compact, standard counter, now readily available from stock, is one of scores of Veeder-Root Counters (both standard and special) for manual, mechanical and electrical operation in every field from electronics to atomics. Just name what you want to count . . . and "The Name that Counts" will help you do the job. Write:

VEEDER-ROOT INCORPORATED
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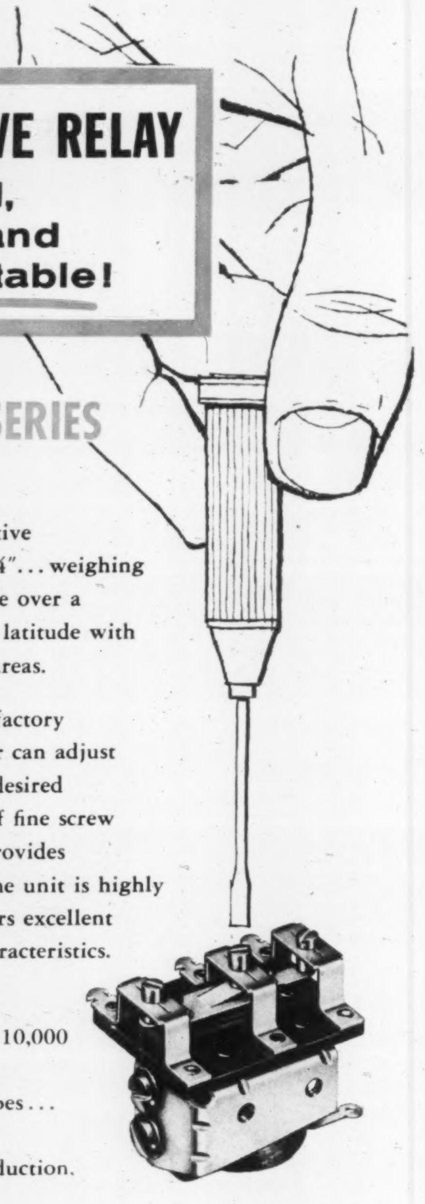
Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

®   **"The Name that Counts"**

For more information circle **36** on inquiry card.

UNIQUE SENSITIVE RELAY
incredibly small,
lightweight and
adjustable!



ADVANCE "SO" SERIES

Here for the first time is a sensitive relay only 1-7/32"x 1-1/8"x 1-1/4"... weighing only 1-1/2 ounces, and adjustable over a wide range. You get much more latitude with this relay in designing for tiny areas.

The Advance "SO" is set at the factory to operate on 10 milliwatts. User can adjust it down to 2 milliwatts, or any desired pick-up or drop-out, by means of fine screw contacts. A balanced armature provides extremely sensitive operation. The unit is highly efficient, ruggedly built, and offers excellent shock and vibration-resistant characteristics.

Contact arrangement is SPDT.
Coil resistances: 4000, 6500 and 10,000 ohms. Life expectancy: 250,000 operations. Available in open types... dust-tight or hermetically sealed enclosures. Now in quantity production. Advance "SO" relays are priced amazingly low. Write for literature.

Coil Resistance	Pick Up Voltage	Pick Up Current	Drop Out Voltage	Drop Out Current	Max. Coil Voltage for Continuous Duty	Overtravel	Contact Gap
4000	6.4 V	1.6 MA	3.2 V	.8 MA	110 V	.0015	.002/.003
6500	8.1 V	1.25 MA	3.9 V	.6 MA	140 V	.0015	.002/.003
10,000	10 V	1 MA	5 V	.5 MA	175 V	.0015	.002/.003

ADVANCE ELECTRIC AND RELAY CO.

ADVANCE RELAYS

2435 N. NAOMI STREET, BURBANK, CALIF.
AN ELGIN NATIONAL WATCH COMPANY AFFILIATE

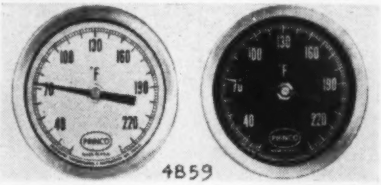
For more information circle **37** on inquiry card.

closed circuits, will also check temperatures (from "room" to 650°F.) of commercial and home appliances; automatically compensates for changes in ambient temperature. Carrying case has a compartment for TCs and replaceable calibrated TCs are available at moderate cost.—*Robertshaw Thermostat Div., Youngwood, Penna.*

For more information circle **235** on inquiry card.

Dial Thermometers

New 5-in.-dial bimetallic thermometers feature simplified design and use of black-and-white contrasts in 4-in. dial faces. Accuracy is 1% of range. Stems are ¼-in. stainless steel, six standard lengths from 4 to 24 in., bottom or back connection. Both pointer and scale can be set through full 360° rotation, permitting vertical "reading axis" regardless of instrument position.—*Precision Thermometer & Instrument Co., 1434 Brandywine St., Phiadelphia 30, Pa.*



For more information circle **236** on inquiry card.

Thermoscopic Papers

New "Thermopapers" are 2-in. strips of chemically-treated paper that undergo irreversible change from white to black at predetermined temperatures; are available in 30 temperature ratings (lowest 115°F and highest 490°F), packaged in vials of 100 ready-to-use strips. Among advantageous uses: checking maximum temperatures of shipments in transit.—*Paper Thermometer Co., 10 Stagg Drive, Natick, Mass.*

For more information circle **237** on inquiry card.

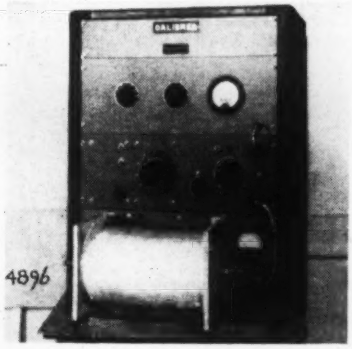
Thermoscopic Tubes

New "Thermotubes" are sealed-in-glass "Thermopapers" (see preceding item), each of which undergoes an irreversible white-to-black change when ambient temperature exceeds rated temperature. Advantage over "Thermopapers" is that tubes can be placed in liquids, in foodstuffs, biologicals, etc. Available in 38 temperatures (lowest 100°F and highest 470°F) packed in polystyrene boxes of 25.—*Paper Thermometer Co., 10 Stagg Drive, Natick, Mass.*

For more information circle **238** on inquiry card.

Temperature-instrument Calibrator

New "Calibreg V" makes available a choice of accurately controlled and stable temperatures; can be operated by untrained technicians. Various ovens are available. Maker recommends "Type G1," a graphite block 8 in. long, 2 in. diam., with 5 cavities to take thermometers or thermocouples,

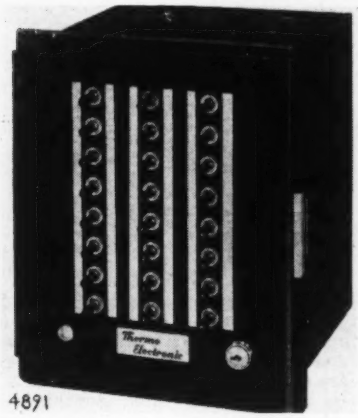

4896

mounted within a 3 in. aluminum pipe. Control accuracy of 0.01 C.° easily obtainable.—*Weiller Instruments Corp., 2 Stone St., New York 4, N. Y.*

For more information circle **239** on inquiry card.

Switch Cabinets

New selector switches for thermocouples and resistance bulbs are key type (telephone), dp 3-position action. Cross-bar contacts are palladium; contact springs are tempered nickel silver; four types including dpdt and 4pdt, locking and non-locking.—*Thermo Electric Co., Inc., Saddle River Township, Rochelle Park P. O., N. J.*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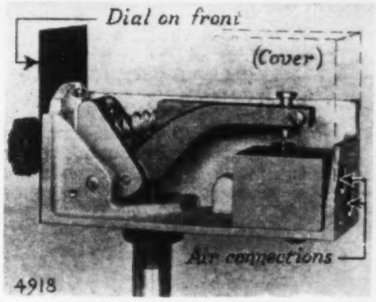
For more information circle **240** on inquiry card.

Temperature Controller

New "Model DA" can be used in any pneumatic system up to 50 psig; will reduce output pressure as temperature increases; is available for temperatures up to 1800°F. Throttling ranges are fixed, but may be specified as narrow as 5 F deg. or as wide as 100 F deg. Outer tube can be brass, stainless steel, or special alloys. Threaded mounting fittings can be supplied when required.—*Burling Instrument Co., 16 River Road, Chatham, N. J.*

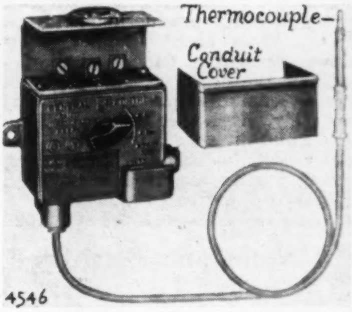


4918

For more information circle **241** on inquiry card.

Automatic Shutoff

New "A-100 Rotary Reset Thermopilot Relay," for automatic safety shutoff of gas-fired appliances, assures safe lighting conditions and gives visual indication of valve's position; is said to be "the only unit of its type on the market."—*General Controls Co., Glendale 1, Calif.*



4546

For more information circle **242** on inquiry card.

FLOW and VOLUME METERING, WEIGHING

Contactor for Liquid Meters

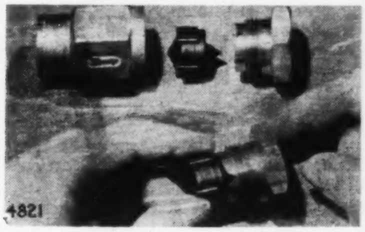
New electrical impulse contactor can actuate open-close circuits at varying rates up to 1,500 times per minute to operate counters, totalizers, printers, stream-samplers, additive-injectors, etc.; is designed for attachment to maker's liquid meters; makes and breaks at intervals proportional to metered number of gallons, barrels, etc.—*Meter and Valve Div., Rockwell Mfg. Co., 400 North Lexington Ave., Pittsburgh 8, Pa.*

4986

For more information circle **243** on inquiry card.

Flow-rate Control

New "Mesurflo" delivers set rate of fluid flow regardless of variable inlet pressures; makes pressure control itself through flexing a molded Neo-


4821

Viking miniature connectors

DESIGNED FOR LONG, RELIABLE SERVICE LIFE

VIKING circular types. Positive polarization and shielding. Simple locking device mates units against vibration. One to four contacts on small units—5 to 9 on large units.

VIKING printed circuit receptacle. Increases your circuits—unit shown has 20 contacts, and is interchangeable with 18-contact types. Extremely strong contacts, pierced or unpierced.

Hermetic sealing is available on the circular and rectangular series. Write for literature on these or the complete line of VIKING connectors.

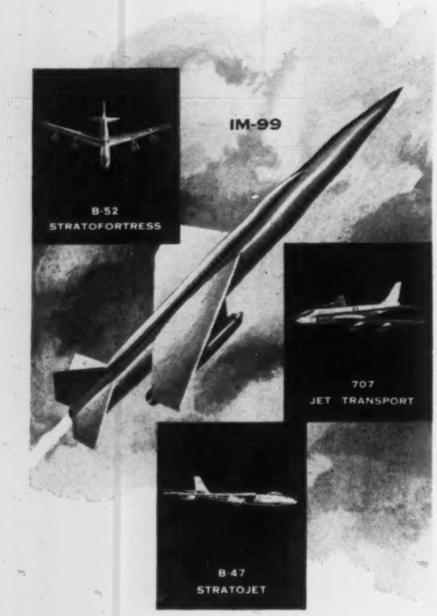
VIKING ELECTRIC
1061 INGRAHAM STREET
LOS ANGELES 27, CALIF.

For more information circle **38** on inquiry card.

Do you think about Angular Acceleration?

BOEING does

...and uses Statham Angular Accelerometers to test...



Statham unbonded strain gage liquid rotor angular accelerometers offer a simple, reliable means for the study of the rotary motion of a test body under conditions where a fixed mechanical reference is not available. For static and dynamic measurements in ranges from ±1.5 to ±3,000 rad/sec^2, four standard models are offered.

Please request Bulletin AA2

Statham
LABORATORIES
LOS ANGELES 64, CALIFORNIA

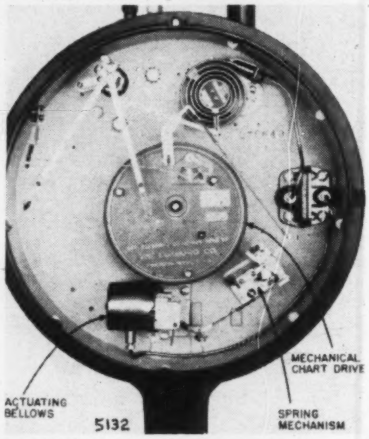
For more information circle **40** on inquiry card.

prene diaphragm into machined grooves and hole of a brass orifice plate.—*Hays Mfg. Co., W. 12th St., Erie, Penna.*

For more information circle **244** on inquiry card.

Flowmeter Accessory for Intermittent Gas Flows

New "Start-Stop" mechanism drives recorder charts only during periods of actual flow, permits accurate recording of intermittent flows on gas lift and other production field operations. With chart stopped between flows, record of each period of flow adjoins the previous, making it possible to compute gas consumption accurately. High-speed chart drives (2, 4, 6 and 8-hr speeds available) spread out record for readability. Makers existing meters can be converted.—*The Foxboro Co., Foxboro, Mass.*

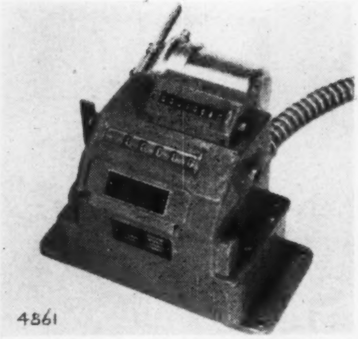


5132

For more information circle **245** on inquiry card.

Automatic Batching Count Controller

New "Model F 281 ERS Automatic Cycling Predetermining Counter" (made by Irion & Vosseler in Germany) is an electrical impulse counter presettable in seconds for any number to 100,000. On reaching set count, process control switch is thrown, counter resets by motor and is ready for next cycle. Also resettable by push button, etc.—*Presin Co., 802 No. Fairfax Ave., Los Angeles 46, Calif.*



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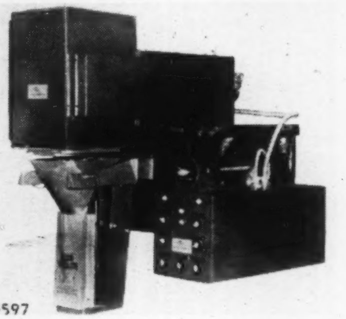
For more information circle **247** on inquiry card.

Filling Scale

New "Model 700G Filling Scale" is a non-flooding gross weighing scale for handling powders (from 8 to 135 lbs. per cubic foot) which are extremely free-flowing or flooding and for filling directly into open-mouth bags, cans or drums. Options enable operator merely to position empty containers and remove filled containers.—*Thayer Scale and Engineering Corp., 494 E. Water St., Rockland, Mass.*



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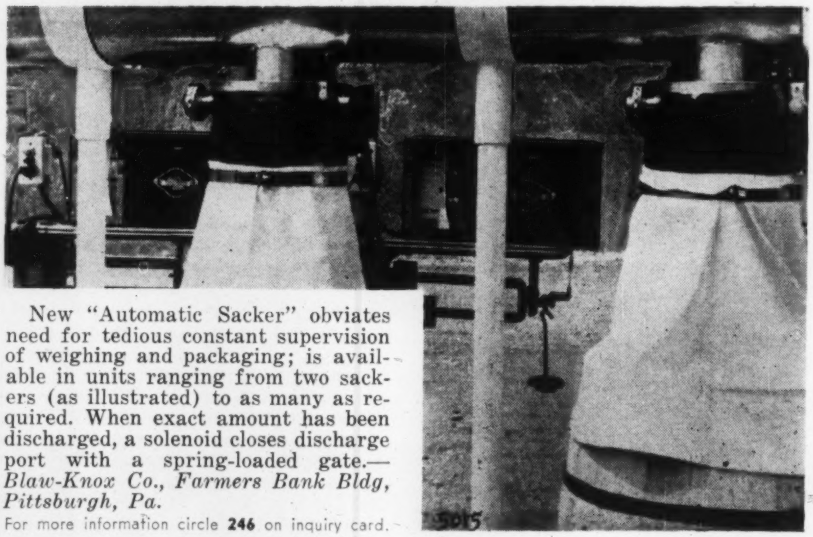
For more information circle **248** on inquiry card.

Pitot Tubes

New Pitot tubes feature inch marks inscribed on both sides, lifetime stainless steel construction, accurately-

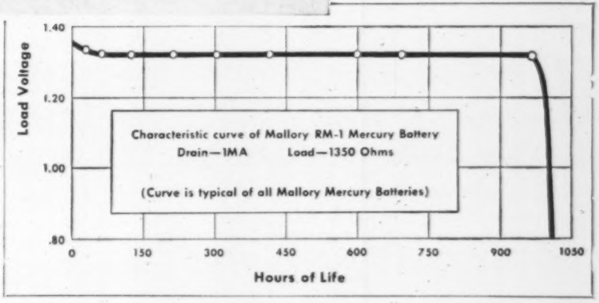
Semi-automatic Plural-filler System



5015

New "Automatic Sacker" obviates need for tedious constant supervision of weighing and packaging; is available in units ranging from two sackers (as illustrated) to as many as required. When exact amount has been discharged, a solenoid closes discharge port with a spring-loaded gate.—*Blaw-Knox Co., Farmers Bank Bldg, Pittsburgh, Pa.*

For more information circle **246** on inquiry card.


1.40
1.20
1.00
.80
Load Voltage
0
150
300
450
600
750
900
1050
Hours of Life
Characteristic curve of Mallory RM-1 Mercury Battery
Drain—1MA Load—1350 Ohms
(Curve is typical of all Mallory Mercury Batteries)

For Constant Voltages... Use Mallory Mercury Batteries

The constant discharge voltages shown in the curves are characteristic of the uniform, dependable power delivered by Mallory Mercury Batteries. This is especially important in mobile communications equipment, hearing aids, delicate optical equipment and many kinds of instruments in which constant discharge voltages are imperative for best performance.

This is only one advantage of Mallory Mercury Batteries, however. They operate dependably at microamperes or drains of 50 amperes . . . intermittently or continuously . . . always providing a dependable, uniform source of power —even after long periods of storage.

If these characteristics will improve the operation of your equipment, then let us send you complete information. Multi-cell battery stacks and packs can be designed to fit your exact needs.

Use Mallory Mercury Batteries for applications where:

Constant voltage or current is required
Size and weight are important
Long storage periods are involved
Battery leakage cannot be tolerated
Wide temperature and pressure ranges are encountered
Severe impact and shock is expected

For Transistor Applications

Mallory Mercury Batteries are especially suited for transistor applications . . . where constant voltage and constant current are required.

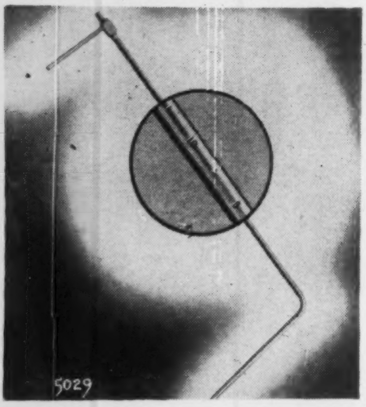
P. R. MALLORY & CO. Inc.
MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Dry Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

P. R. MALLORY & CO. INC., BATTERY DIVISION, NORTH TARRYTOWN, N.Y.

For more information circle **39** on inquiry card.

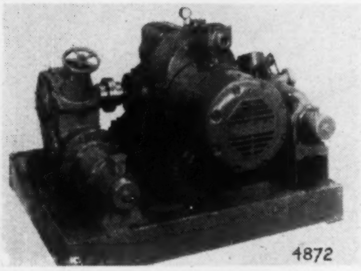

5029

sized and burr-free static holes; are available in lengths from 12 to 60 in., for all types of air-velocity or static pressure measurement; are furnished with chart for determining air velocities plus curves for elevated temperatures, etc. Also available: integral mounting gland for ½-in or ¾-in pipe thread, and split flange for duct mounting.—*F. W. Dwyer Mfg. Co., P.O. Box 373, Michigan City, Indiana.*

For more information circle **249** on inquiry card.

H-p. Metering Pumps

Seven new "Controlled Volume Pumps" are offered to cover range 7500 to 50,000 psi. Maximum capacity at 50,000 psi is 12.5 gph; at 7500 psi, 94 gph. Materials of construction below 25,000 psi are 300-series stainless steel with 400-series trim. Above 25,000 psi, Ni-Cr-Mo steel with tungsten carbide trim. It is said that high volumetric efficiency is assured, even at ultrahigh pressures, by "HyROY-metric" drive transmission.—*Milton Roy Co., 1300 East Mermaid Lane, Philadelphia 18, Pa.*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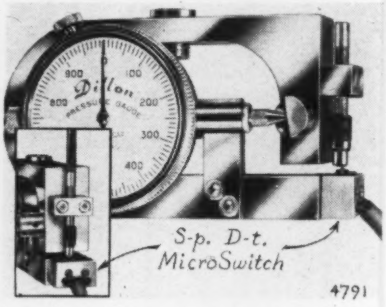
For more information circle **250** on inquiry card.

Force or Load Switch

New model of "Mechanical Pressure Gauge" actuates a subminiature "Micro-Switch" at a preset load, is available in any of ten capacities from 0-10 lbs. up to 0-10,000 lbs.—*W. C. Dillon & Co., Inc., P. O. Box 3008, 14620 Keswick St., Van Nuys, Calif.*



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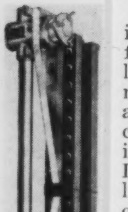
For more information circle **251** on inquiry card.

LIQUID (and Granular-material) LEVEL

Gage Illuminators

Newly improved gage illuminators give even diffusion of light over entire length of gage glass with no glare spots or blinding areas; incorporate principle of solid-wedge lighting combined with plastic. Illumination from a single light source (a 15-w. bayonet base bulb on "EPL 51 Model" and up to a 60-w. medium base bulb on "EPL 54 Model") is reflected from angular surface of a ¾-in. thick plastic wedge, flows evenly through transparent gage glass. Explosion-proof or non-explosion-proof models in single- and double-section styles for all sizes of gages.—*Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass.*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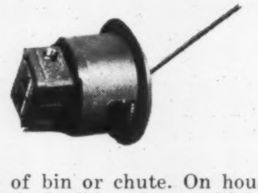
For more information circle **252** on inquiry card.

Explosion-proof Level Controller and Seal

New explosion-proof model of maker's automatic level controller meets demand for a trouble-free flow control instrument that will control dry and wetted materials under inflammable and explosive conditions. New flexible sphere, to seal control units, is adaptable to extremes of industrial process temperatures. Housing is bolted to outside of bin or chute. On housing's bin side is flexible sphere, which rests in a hole in bin wall just large enough (about 2⅜ in) to admit it. Rod ("sensing probe") runs from inside housing through flexible sphere out into bin, where it may be set to desired angle.—*Scrayco, 201 Greene Ave., Bound Brook, N. J.*



For more information circle **253** on inquiry card.

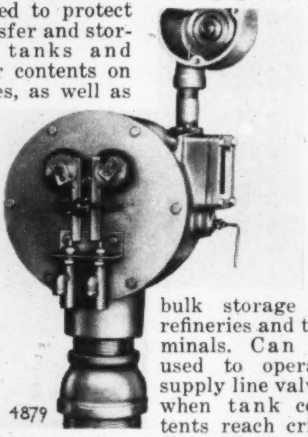
Liquid-level System

New liquid-sensing unit detects presence of liquid in 0.4 sec and absence of liquid in 5 sec. Complete system comprises a probe containing a thermistor, a power-control package, and an interconnecting cable. Control unit can be obtained in explosion-proof or vapor-proof models. Multiple probe types are available. Probe is not subject to wear, clogging or corrosion; is unaffected by vibration. No electrical contact is made with liquid. Liquid temperature range –319°F to 200°F. Applications include (1) fuel system low-level warning or high-level cut-off, (2) sequencing liquid from one tank to another when predetermined levels are reached, (3) to indicate presence or absence of liquid.—*Air Associates, Inc., Teterboro, N. J.*

For more information circle **254** on inquiry card.

Liquid-level Controller

New automatic level controller for maker's automatic tank gages is designed to protect transfer and storage tanks and their contents on leases, as well as bulk storage at refineries and terminals. Can be used to operate supply line valves when tank contents reach critical high or low points. Pneumatic valves operate on air or gas pressure up to 25 psi.—*Shand & Jurs Co., 917 Carlton St., Berkeley 10, Calif.*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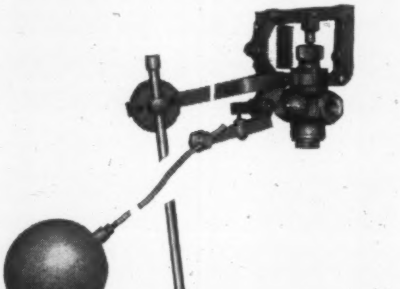
For more information circle **255** on inquiry card.

Liquid-level Controller

New differential float valve, for use where fast-acting full-off and full-on control is required, is especially suited to control ejector or motor-driven pumps where a pressure switch is used. Four sizes of direct-operated valves: ⅜, ½, ¾ and 1 in. Larger sizes are pilot-operated, using direct-operated valve as pilot.—*Klipfel Valves, Inc., 1075 Lincoln Ave., Hamilton, Ohio.*

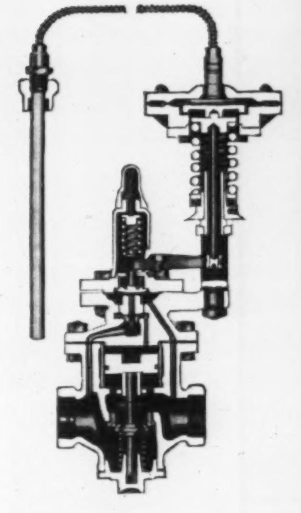


For more information circle **256** on inquiry card.

Double-duty with a single pilot -only Leslie Duo-matic does it

. . . in temperature regulation

This is it!



Leslie Class LTCO Duo-matic temperature and pressure regulator.

The Duo-matic Leslie temperature regulator for controlling steam flow is a single unit, with a *single* internal pilot valve—yet it controls automatically both temperature and pressure conditions. No hunting or cycling on low flows . . . eliminates temperature "droop" on heavy loads.

Simplified piping and better control of fuel oil heaters, instantaneous and storage type heaters, driers, process heaters, kettles, open tanks, ovens, degreasing machines, steam tables, sterilizers, etc., more than offset the initial cost of this superior regulator.

Investigate "dual-function" Duo-matic regulators — proven in service for over 19 years of applications.

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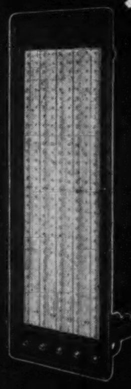

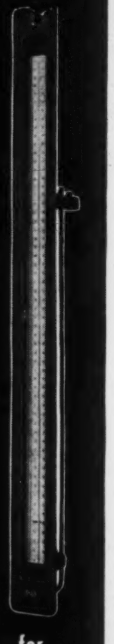

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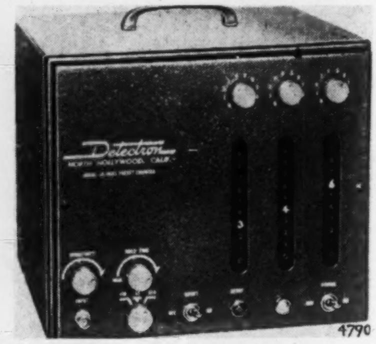
For more information circle **42** on inquiry card.

COUNTING and COMPUTING

Preset Counters

New "DS-8600 Series" high-speed preset counters are offered in five models, with count capacities from 100 to 1,000,000. All units operate on 117 v.ac.; weigh from 15¾ lbs. to 10¾ lbs.—*Computer-Measurement Div., Detectron Corp.*, 5528 *Vineland Ave., North Hollywood, Calif.*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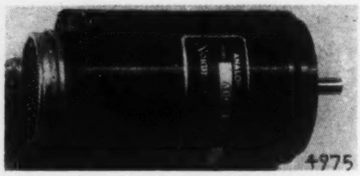
For more information circle **257** on inquiry card.

Digital Converter

New "ADC-1A Analog to Digital Converter" features high count (8192 numbers) for small size; accuracy 0.006%; unambiguous output; natural binary number output; no translation equipment necessary; simple resistor-network or flip-flop driving circuit; parallel output of all 13 bits plus complements; readout rate up to 10^6 per second resolution one part in 16,384. Numerous applications other than computer can be imagined by considering new device as analagous to a synchro in a digital data-handling device.—*Norden-Ketay Corp.*, 555 *Broadway, New York* 12, *N. Y.*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For more information circle **258** on inquiry card.

Electric Counters

New "PIC-600 Series" in basemount and panelmount models feature 50-million count-life, 1000 counts per minute rating, 7-watt power consumption, balanced armatures, no ac hum when energized and continuous-duty coils.—*Production Instrument Co.*, 710 *W. Jackson Blvd., Chicago* 6, *Ill.*

1 2 3 4 5 6
PIC-600
PRODUCTION INSTRUMENT COMPANY
CHICAGO

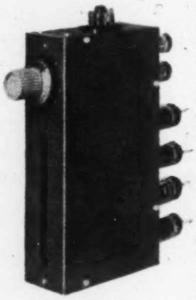
For more information circle **259** on inquiry card.

Six-decade Shaft-rotation-to-digital Converter

New 6-decade "Digitizer" analog-to-digital converter supplements maker's standard line of 3, 4, and 5-decade models. New 6-decade standard version will accumulate a total of one million counts at rate of 10, 40 or 100 counts per turn of input shaft. It can be operated for continuous readout with brushes and contacts engaged or can be used in an "on demand" type readout system to eliminate wear on brushes and contacts and minimize torque. With the brushes and contacts retracted during rotation, speeds upward of 18,000 rpm at units decade (corresponding to 3,000 digits per second) can be attained. Dimensions about 7.4x5x1.1 in. Weight about 3 lbs.—*Coleman Engineering Co.*, 6040 *W. Jefferson Blvd., Los Angeles* 16, *Calif.*

For more information circle **260** on inquiry card.

Preset Decade Counters



New digital counters deliver an output pulse after receiving a predetermined number of input pulses, preset by selector switch. By virtue of coincidence circuit (based on the 9's complement of the number) new counters eliminate unequal delays of output pulse for different numbers; are therefore suited for generation of precision delays. Many other applications. New decades come in three maximum counting rates: 20, 40, and 100 kc.—*Laboratory for Electronics, Inc.*, 75 *Pitts St., Boston* 14, *Mass.*

For more information circle **261** on inquiry card.

Digital-Analog Computer

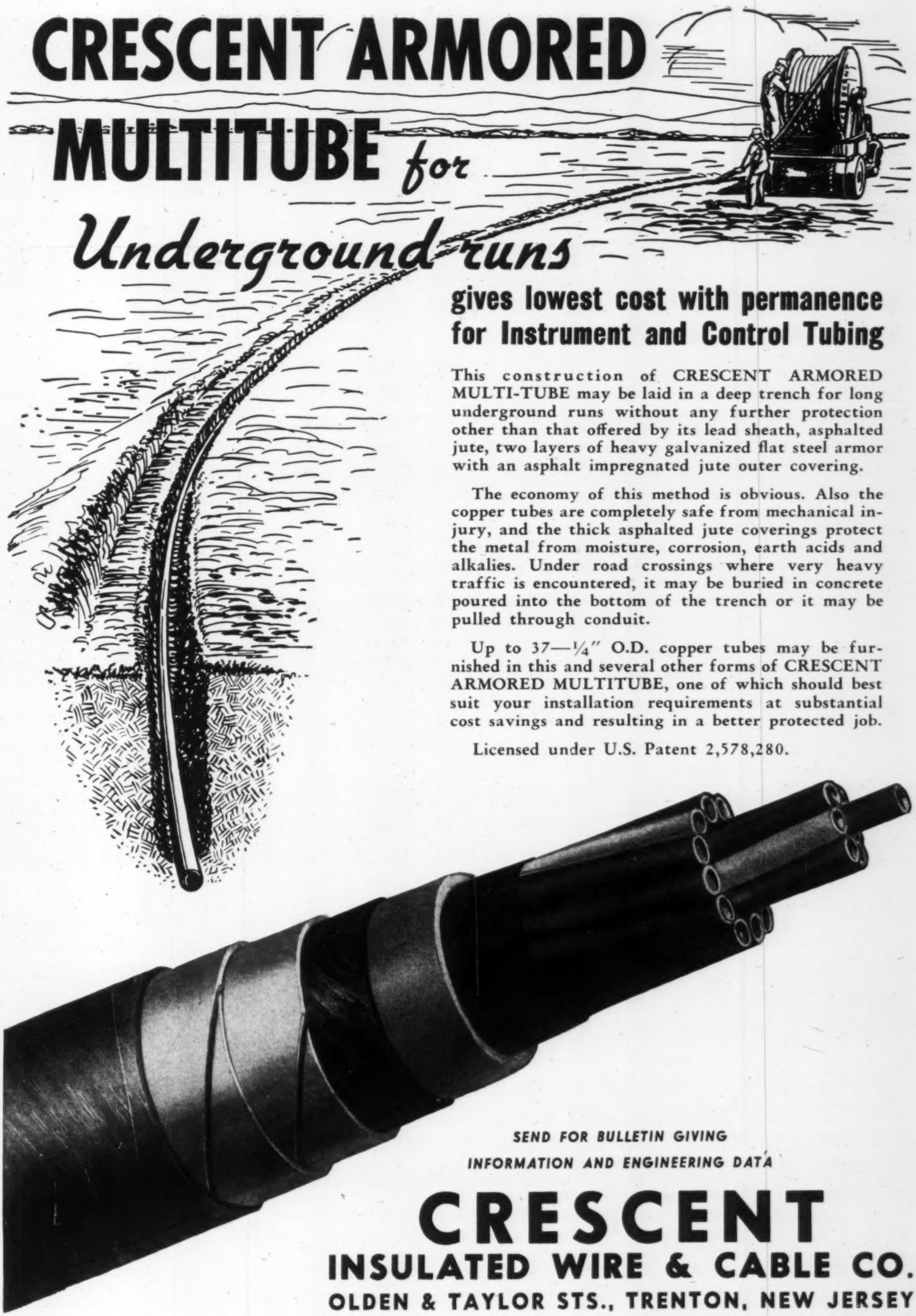
New "Wedilog" is said to be a unique electronic digital-analog differential computer. It operates on principle of functional simulation, using numbers instead of voltages; will solve linear and non-linear ordinary and partial differential equations, integral equations, and simultaneous differential and algebraic equations. It is said to combine simplicity of problem set-up of dc analog computer with accuracy and resolution of a full-scale digital computer. Machine resolution is five decimal digits. All numbers are handled as true number with sign.—*Wang Laboratories*, 37 *Hurley St., Cambridge, Mass.*

For more information circle **262** on inquiry card.

Transistorized Computer

New "608," said to be "the first completely transistorized computer available for commercial installation," operates without the use of a single vacuum tube. Magnetic cores make up machine's memory. This is said to be "the first known use of transistors and cores together in a computer." "608" can perform 4,500 additions a second,

CRESCENT ARMORED MULTITUBE *for Underground runs*



gives lowest cost with permanence for Instrument and Control Tubing

This construction of CRESCENT ARMORED MULTI-TUBE may be laid in a deep trench for long underground runs without any further protection other than that offered by its lead sheath, asphalted jute, two layers of heavy galvanized flat steel armor with an asphalt impregnated jute outer covering.

The economy of this method is obvious. Also the copper tubes are completely safe from mechanical injury, and the thick asphalted jute coverings protect the metal from moisture, corrosion, earth acids and alkalies. Under road crossings where very heavy traffic is encountered, it may be buried in concrete poured into the bottom of the trench or it may be pulled through conduit.

Up to 37—¼″ O.D. copper tubes may be furnished in this and several other forms of CRESCENT ARMORED MULTITUBE, one of which should best suit your installation requirements at substantial cost savings and resulting in a better protected job.

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two and one-half times faster than "607." It can multiply two 9-digit numbers and yield 18-digit product in 0.011 sec. Calculating punch unit provides 50% greater card output than now available in "607." External manual and visual controls permit operator to test complicated calculating routines before proceeding with a problem.—*International Business Machines Corp., 590 Madison Ave., New York 22, N. Y.*

For more information circle **263** on inquiry card.

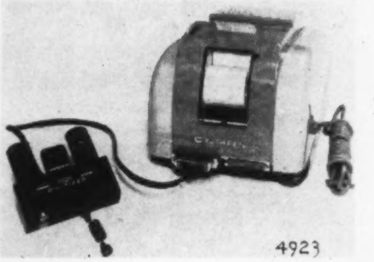
Transistor for Computers

New "GT-88" diffused *p-n-p* junction transistor has 1-Mc alpha cut-off frequency, is encapsulated in plastic and hermetically sealed in a can. Collector voltage −25 volts; dissipation at 50°C 70 mw; junction temperature 85°C; collector cut-off 15 ua. Immediate delivery.—*General Transistor Corp., 95-18 Sutphin Blvd., Jamaica, N. Y.*

For more information circle **264** on inquiry card.

Digital Readout System

New digital readout system consists of a 3 or 4-decade Coleman "Digitizer," a modified Clary "Model 1900" printer, and a small box containing relays, etc. (attached to system through a plug mounted on back of Clary printer). System converts shaft rotation at rate of 10, 40 or 100 counts per turn of shaft to direct printed readout. The 3 or 4 digits are printed simultaneously on closing readout switch. Several "Digitizers" can be fed into one printer and selected by switch. Systems are also available to print out simultaneously the values from two "Digitizers" in the same horizontal row; others to print out a digital value representing shaft position and time of day in hours, minutes, and hundredths of minutes.—*Coleman Engineering Co., 6040 W. Jefferson Blvd., Los Angeles 16, Calif.*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For more information circle **265** on inquiry card.

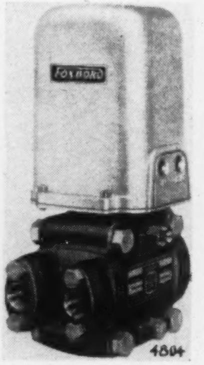
Computer Storage Tube

New "RCA-6571" storage tube, for use in binary-digital computer systems, features a storage surface providing relatively uniform secondary emission to prevent "bad spots" on which information cannot be stored, and a focused beam having exceptionally small effective area and well-defined boundary. It is of single-beam type with electrostatic focus and deflection and has its storage surface on inner surface of faceplate; 3-in diam; over-all length 11-in; duodecal 10-pin base.—*Tube Div., RCA, 30 Rockefeller Plaza, New York 20, N. Y.*

For more information circle **266** on inquiry card.

PRESSURE and VACUUM

Differential-pressure Transmitter



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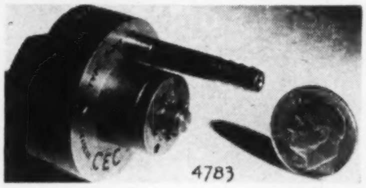
New "Model 13A" of maker's "d/p Cell Transmitter" provides continuous adjustment over entire range of 0-50-in. to 0-250-in. of water differential without change of parts. Unitized "block" construction of body, transmitter and air relay eliminates effects of piping stresses. Other new features include temperature-stable parts (such as "Elgiloy" sealing diaphragm); automatic damping and filtering of flow "noises" at measurement source while permitting rapid response to flow.—*The Foxboro Co., Foxboro, Mass.*

For more information circle **267** on inquiry card.

Low-pressure Pickup

New "Type 4-315" miniature low-pressure pickup, available in standard ranges of ±1, ±2 and ±3 psid., is not adversely affected by vibrations in such applications as aircraft flight tests. Sensitivity 10 mv. full-scale open-circuit output at 5-v. excitation; input and output impedances 350 ohms; linearity within 1% of full-scale output; hysteresis less than 1%.—*Consolidated Engineering Corp., Pasadena 15, Calif.*



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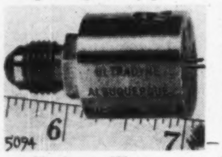
For more information circle **268** on inquiry card.

Pressure Pickup

New "Model S-6" is a single-coil diaphragm-type variable-inductance unit, for use either as variable inductor of inductance-controlled FM/FM subcarrier oscillators, or for voltage-controlled oscillators and bridge circuits. For voltage output applications it is supplied with a matched dummy so that pickup and dummy become two arms of bridge. Depending on application, it is constructed so that curves of pressure vs. frequency, pressure vs. inductance or pressure vs. voltage will be linear (can also be made non-linear



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Shown in combination cutaway and phantom

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Familiar in external appearance, all these portables are totally *different* inside. The movement employed is the highly stable, self-shielded WESTON CORMAG® mechanism. The *difference* is evident, in service, in several ways. The movement is far more rugged . . . more resistant to vibration and shock . . . thus protecting instrument accuracy and dependability over far longer periods. There never need be concern about external magnetic fields, for the yoke design provides a permanent magnetic shield . . . so efficient that an instrument may be used at a distance of only 15 inches from a conductor carrying 1000 amperes and show an effect of less than 1/10 of 1%. And the instrument is far lighter in weight . . . more convenient in handling. Complete details on these Weston CORMAG® portables may be obtained from your local Weston representative, or direct from WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.

WESTON
Instruments

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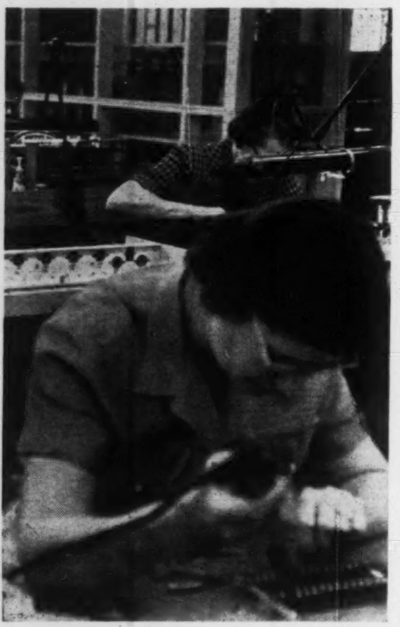

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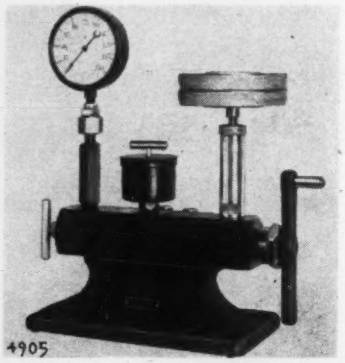
For more information circle **46** on inquiry card.

to match a given curve). Acceleration effect is 0.01%/*G* or less; risetime to a step pressure pulse is about 50 microseconds. Standard pressure ranges from 1 to 500 psig, psid, or psia.—*Ultradyne Engineering Labs, Inc., P. O. Box 8007, Albuquerque, N. M.*

For more information circle **269** on inquiry card.

Dead-weight Testers

New improved models of dead weight pressure testers require no skilled labor; are guaranteed accurate within 0.1% of indicated reading. Three models: up to 3000 psi; 4000-6000 psi; up to 10,000 psi.—*Amthor Testing Instrument Co., 45 Van Sinderen Ave., Brooklyn 7, N. Y.*



For more information circle **270** on inquiry card.

Pressure Controller

New "Model 110 Pressure Pilot" features integral gage for process pressure indication and direct setting of control point on same calibrated gage dial; feedback proportional control or differential gap control with snap action over a 2%-to-100% band; low nozzle pressures for linear response and output pressure up to 30 psi.; sapphire nozzle feed orifice with push-button cleaner; Bourdon elements from 0-15 psi. to 0-10,000 psi.—*Hammel-Dahl Co., 175 Post Road, Providence 5, R. I.*

100
150
200
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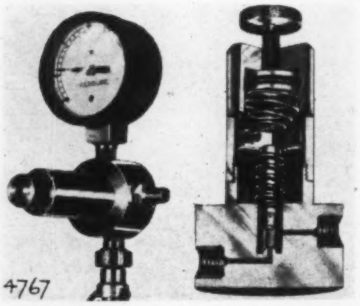
300
4818

For more information circle **271** on inquiry card.

Pressure Regulator

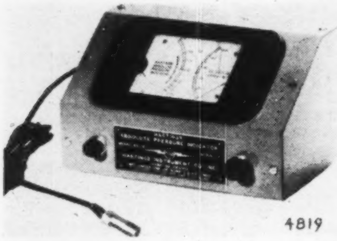
New pressure regulator features a simplified piston arrangement (brass cylinder, brass piston and two cadmium-plated steel springs) which "can be disassembled and reassembled in less than one minute without the use of tools"; can reduce 3000 psi to ounces and is claimed to "do the work of several ordinary regulators." Available with oxygen or standard gage.—*Beacon Devices, Inc., 78 Oliver St., North Tonawanda, N. Y.*



For more information circle **272** on inquiry card.

Absolute Pressure Gage

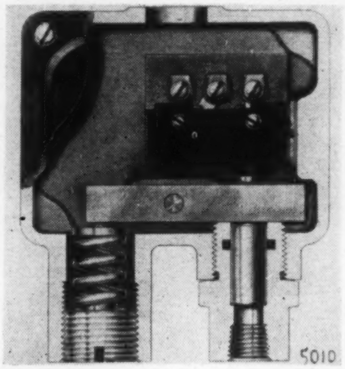
New Absolute Pressure Indicator features range of 0.1 mm. Hg to 20 mm. Hg and expanded scale in 0.5-to-5 mm. range; noble-metal thermocouples in nickel-plated gage tubes (affording freedom from outgassing, system contamination and corrosion); quick response. Instrument can be used with a one-knob switching unit to monitor many points in a system.—*Hastings Instrument Co., Inc., Hampton, Va.*



For more information circle **273** on inquiry card.

Pressure Switches

New heavy-duty piston-type pressure switches cover adjustable range of 35 to 12,000 psi (proof range 4500 to 20,000 psi). Piston and its bore are fine-honed to achieve uniform repeat accuracy. Sealed-piston design simplifies installation and obviates need for drain return piping. Ample piston travel prevents undesired actuation by surges or vibrations. Actuation point (on increasing or decreasing pressure) from 15 to 1000 psig.—*Barksdale Valves, 5125 Alcoa Ave., Los Angeles 58, Calif.*



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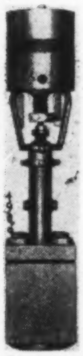
VALVES



Control Valves for Molten Metals

New "Series 1401" control valves are for Na,K and similar molten metal services. Body rating 150 psi at 1600° F. Body sizes ½-in. through 6-in. with maker's "Domotor," cylinder or manual operators. Also various end connections. Photo shows cylinder-operated remote shut-off valve.—*The Annin Company, 6570 E. Telegraph Road, Los Angeles 22, Calif.*

For more information circle **275** on inquiry card.

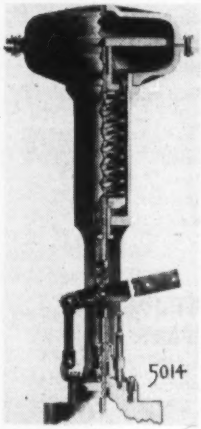
Process-control Valve

5047

New "Ultravalve" is said to incorporate all the features of special valves used on the most dangerous applications. Unique body design requires minimum material. Three body styles: offset, angle, or inline. Offset (shown) provides complete self-drainability essential with toxic or corrosive substances. In such hazardous service "Ultravalve" design doubly insures against stem leakage: "Bellows Seal" welded to stem supplemented by standard "Dahl Seal" in bonnet. Nominal valve sizes from ½ in. to 6 in.—*Hammel-Dahl Co., 175 Post Road, Providence 5, R. I.*

For more information circle **276** on inquiry card.

Quick-trip Safety Valve



5014

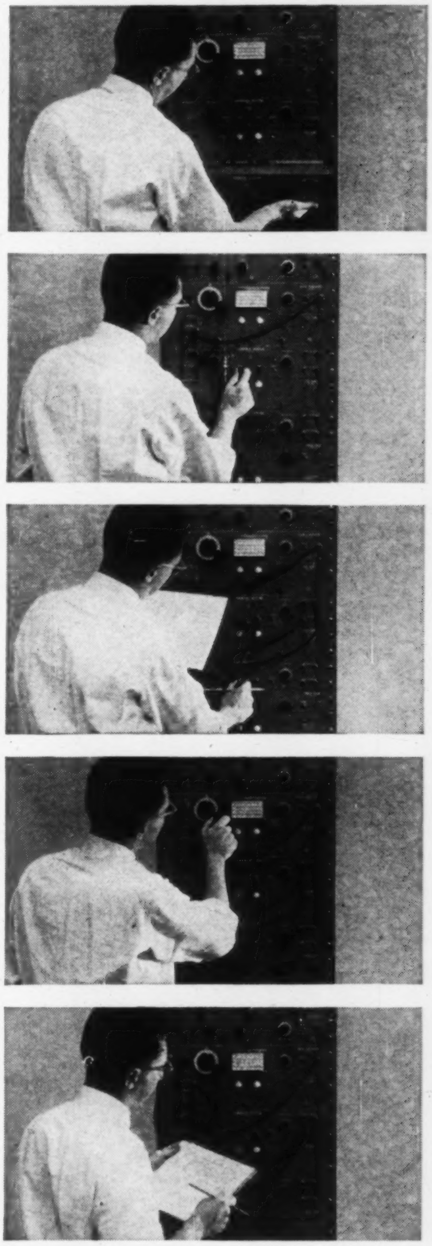
New "Type 73-20 Manual Reset Valve," for emergency safety services requiring quick positive action, can serve as a safety shutoff in liquid or gas fuel lines, as a safe open valve for steam or foam fire snuffing systems, or to shut down pipelines that indicate a line break by loss of pressure. It utilizes bodies, trim, and topworks of maker's diaphragm-motor valves with delatching trip mechanism whose response remains effective until manually reset.—*Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 26, Mo.*

For more information circle **277** on inquiry card.

Air Valves

New line of air control valves comprises 24 models: 4-way valves with ¼-in., ⅜-in. or ½-in. ports for opera-

How BURROUGHS PULSE UNITS help engineers get more done



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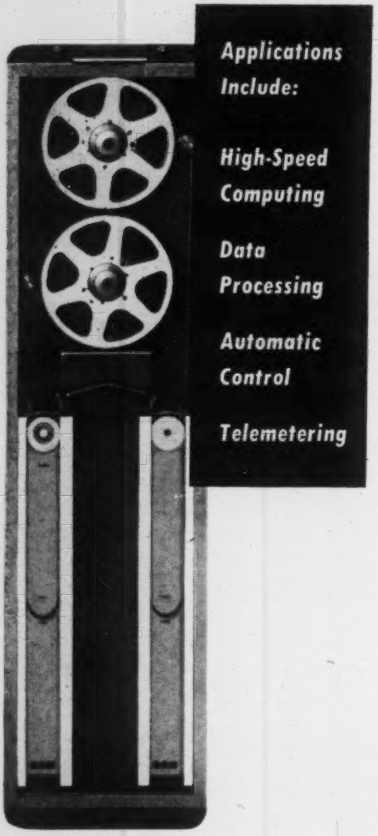
For more information circle **47** on inquiry card.

DataReader
Model 546

A transport unit for high speed searching, reading and recording of data on magnetic tape.



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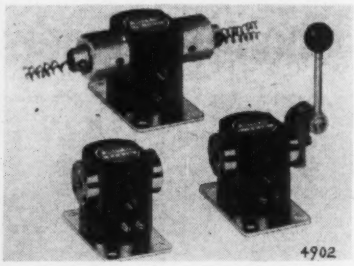
For more information circle **48** on inquiry card.

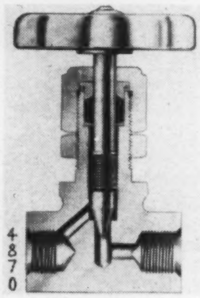
NEW INSTRUMENTS


4902

tion from 5 to 150 psi.: double-solenoid, air bleed, air pilot and hand valve.—*A. K. Allen Co., 57 Meserole Ave., Brooklyn 22, N. Y.*

For more information circle **278** on inquiry card.

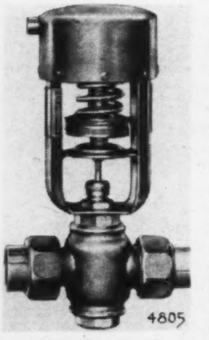
Needle Valve


4870

New 10,000-psi. needle valve features "T" shaped stainless steel forging which combines body and stem guide. Result is said to be a valve body that "cannot leak or come apart, even with a 25,000 psi proof test." Sizes ⅛, ¼, ⅜, and ½ in.—*Republic Mfg. Co., 15655 Brookpark Road, Cleveland 11, Ohio.*

For more information circle **279** on inquiry card.

Bellows-motor Valve

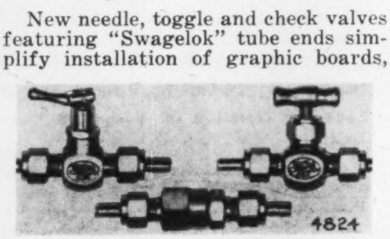

4805

New "No. 992-D" valve, for use with hydraulic and pneumatic control systems, is equipped with a cadmium-plated steel spring and two-ply seamless metal bellows; can control flow of steam, gas, oil, water and other fluids; is said to be "satisfactory for over 50 percent of industrial applications where motor valves are used" and to "possess a linear valve movement." Sizes from ¼-in. to 4 in.; wide variety of valve types; direct- or reverse-acting styles.—*Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Box 400, Knoxville, Tenn.*

For more information circle **280** on inquiry card.

"Swagelok"-end Valves

New needle, toggle and check valves featuring "Swagelok" tube ends simplify installation of graphic boards, instrument air lines, test panels and pilot plants.—*Hoke, Inc., 231 South Dean St., Englewood, N. J.*


4824

For more information circle **281** on inquiry card.

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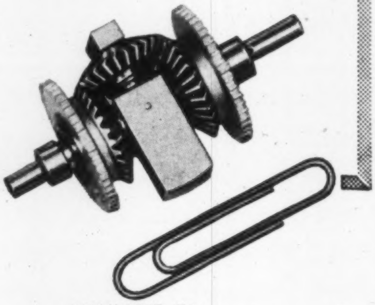
SPIDER GEAR DIFFERENTIALS
by FORD INSTRUMENT are
7 ways superior



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four sizes: 1/8", 3/16", 1/4", and 5/16" shaft diameters
FOR EARLY DELIVERY

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42

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Rate Generators
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Servo Motors
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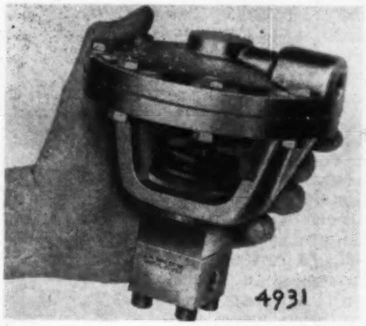
For more information circle **49** on inquiry card.

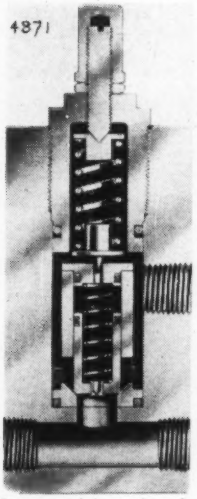
Miniature Control Valve

New 6-in. high "Bantam" valve, for 3-to-15-psig control air, weighs 3¼ lbs, is said to provide low hysteresis and instantaneous response on service up to 1000 psi at 350°F.—*George W. Dahl Co., 430 High St., Bristol, R. I.*



For more information circle **282** on inquiry card.

Relief Valve



New design piston-type pilot-operated relief valve protects system, pump, and other hydraulic units against damage from pressure overload. Sizes ¼-in. to 2-in.; aluminum alloy or 50,000-psi. tensile semi-steel. Three pressure ranges: 50-1000, 1000-2500 and 2500-4000 psi. Precise adjustments can be made within each range.—*Republic Mfg. Co., 15655 Brookpark Road, Cleveland 11, Ohio.*

For more information circle **283** on inquiry card.

High-pressure Acid Valve

New "Model BX 115," for use in flow lines carrying any type of corrosive liquid under high pressure, withstands pressures up to 1000 psi; is made of a homogeneous nonporous Saran plastic enclosed in a stainless steel jacket. Valve tip also made of Saran plastic insures that liquids flowing through line will not corrode it nor themselves be contaminated by coming in contact with metal. Safety features prevent valve stem blowout, prevent removing stem by opening it too far, and guard valve seat against damage from excessive tightening. Two standard sizes with ports tapped for either ⅛ or ¼-in standard metal or plastic pipe (larger sizes special). A different model is avail-

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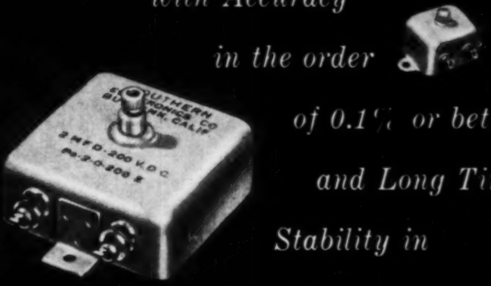

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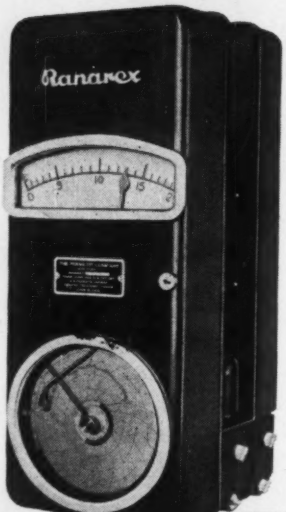

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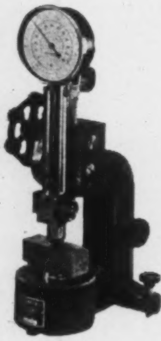

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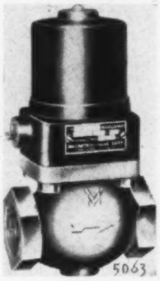
For more information circle 117 on inquiry card.

able for lines where pressures do not exceed 200 psi. Special valve saddles are available to fasten valve to control panels.—*Exline Engineering Co., 1636 E. 6th St., Tulsa, Okla.*

For more information circle **284** on inquiry card.

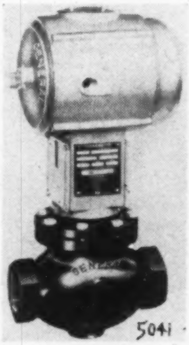
Packless Solenoid Valve



New "Type S" packless solenoid valve utilizes line pressure to assist solenoid in opening and closing valve; is designed for normally-closed operation; provides a full port equal to nominal pipe size opening; can be applied to control automatically (or from remote points) flow of steam, hot liquids and gases not injurious to bronze, at fluid temperatures up to 400°F. An auxiliary operating piston assists solenoid in opening valve against higher line pressures. At low or no pressure, solenoid alone actuates valve.—*Magnatrol Valve Corp., Hawthorne, N. J.*

For more information circle **285** on inquiry card.

Electrohydraulic-motor Fail-safe Valves

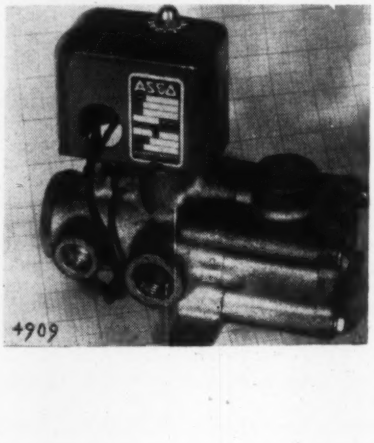


New "H Series" of maker's "Hydramotor" valves meet special requirements of automatic oil lease operation; utilize electrohydraulic principle of operation in such manner that electric power required during 12- to 23-second opening cycle is little more than for a 100-watt light bulb. Heavy return spring provides important "fail-safe" feature. Standard sizes from 1-in. to 3-in. pipe, maximum pressures from 50 to 400 psi, available in 115/60 and 230/60 voltages.—*General Controls Co., Glendale 1, Calif.*

For more information circle **286** on inquiry card.

4-way Solenoid Valve

New "Bulletin 8344" 4-way poppet-type solenoid valve is free from piston malfunction due to binding or residual



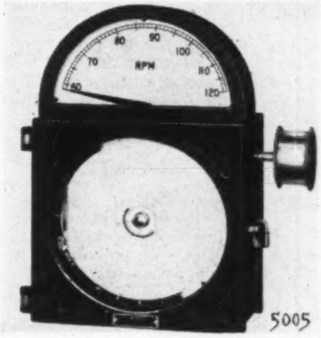
magnetism; features cycling rates up to 850 per minute; is power-operated in both directions; operates in any position and on all standard voltages. Power consumption 10 watts. Standard, watertight, or explosion-proof models. Sizes ⅜, ½, ¾ and 1 in.—*Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.*

For more information circle **287** on inquiry card.

SPEED

Indicating and Recording Centrifugal Tachometer

New "Type 317" utilizes purely mechanical principle, therefore is unaffected by electric or magnetic fields and by ambient-temperature changes. Either 12-hr or 24-hr drive for 8-in chart which can be graduated for particular machine: sheets per hour, rpm, fpm, etc.—*Amthor Testing Instrument Co., 45 Van Sinderen Ave., Brooklyn 7, N. Y.*



5005

For more information circle **288** on inquiry card.

Contact-making Centrifugal Tachometer

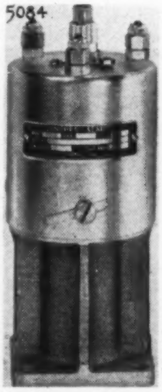
New "Model SA-6" utilizes purely mechanical speed-measuring principle unaffected by electric or magnetic fields and by ambient temperature, has adjustable high and low limit contacts for alarm or automatic-control functions. These contacts carry 3 microamperes or less; power relay (in "control box") will handle a 350-watt noninductive load.—*Herman H. Sticht Co., 27 Park Place, New York, N. Y.*

For more information circle **289** on inquiry card.

Centrifugal Switch

New "Model GA-3" three-element speed-sensitive switch is added to maker's line of one- and two-switch governors. It can be arranged to open or close three separate circuits at three different speeds anywhere between 1,200 and 10,000 rpm (lower or higher speeds on special order). Any of the three trip points can be easily adjusted after installation. Principle: flyweights acting upon snap switches, obviating need for collector rings. Contact

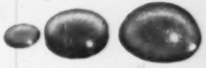
5084



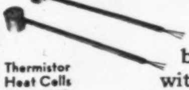
THE *true* STORY
of
INFRA-RED RIDING HOOD

This is the real low-down. Contrary to the stories about the fateful day I hiked to Grandma's place—the wolf didn't pull the wool over my eyes! Before he knew what was happening, I had him spotted with my SERVOTHERM* system.

Man, is that a batch of instruments! They measure temperature where no contact is possible. My SERVOTHERM system measured the wolf's temperature and differentiated it from the ambient. Those SERVOFRAX glass lenses are real fast—the only glass that will pass the long wave lengths.



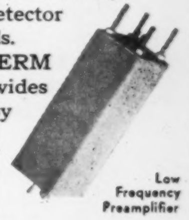
Infrared Lenses and Windows



Thermistor Heat Cells Type 1312

Behind my SERVOFRAX window, I had a SERVOTHERM cell (type 1312, of course!) because it's a fast, sensitive infra-red detector with a time constant less than .005 seconds.

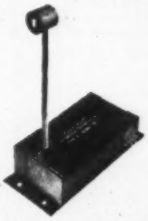
For a preamp, I used the finest—SERVOTHERM Model 1322 low frequency pre-amplifier that provides high gain and high impedance output. This baby is small enough to put in your vest pocket and is terrific for initial amplification for sub-audio and audio frequency signals from extremely low input levels.



Low Frequency Preamplifier

So . . . take a tip from a gal who knows—get on the ball with SERVOTHERM systems and keep the wolf away from *your* door!

*t.m.



Detector Preamplifier Model 1321

Thermistor Power Unit Model 1330

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☐ Low Freq. Preamp. #1322 ☐ Detector Preamp. #1321
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☐ Thermistor Heat Cells, Types 1312, 1317, 1340

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Position........
Company Name........
Company Address........
City........ Zone........ State........

IA7

For more information circle **51** on inquiry card.

TIME

NEVER STATIC

HAYDON*

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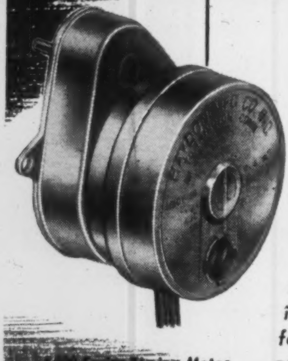

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For more information circle **52** on inquiry card.

"chatter" has been minimized. Contacts are rated 10 amp 115 vac.—*Synchro-Start Products, Inc., Skokie, Illinois.*

For more information circle **290** on inquiry card.

TIME

Elapsed-time Indicator

TOTAL HOURS

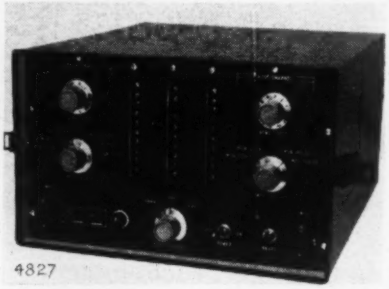
4788

New "Series HD-654" registers operating times of machine tools, etc., to insure maintenance and replacement at desired intervals; can be provided to register 1/10-hour increments to 9999.9, or hour steps to 99999. Self-starting synchronous motors for 60 or 400 cps.—*DeJur-Amsco Corp.*, 45-01 *Northern Blvd., Long Island City* 1, *N. Y.*

For more information circle **291** on inquiry card.

Time-interval Indicator

New "Model 4010" measures time intervals between two consecutive electrical actions which need not be identical. Gating circuits "lock out" after being triggered. Time base frequencies of 1000 and 100 cps. for measurement of longer periods. Time ranges 0-0.0999 sec. in 0.0001-sec. increments, 0-0.999 sec. in 0.001 and 0-9.99 sec. in 0.01.—*I-L-S Instrument Corp.*, 10701 *Briggs Road, Cleveland* 11, *Ohio.*



4827

For more information circle **292** on inquiry card.

Time Controllers

New line of timers covering range of 10 seconds to 80 hours comprises three models, ECA-3, ECA-4 and ECA-5, designating measurement of one, two, and three intervals respec-

4877

tively. Units can be supplied wired, ready to operate various programs, eliminating single-purpose timers and saving installation costs.—*Seely Instrument Co., Inc., Niagara Falls, N. Y.*

For more information circle **293** on inquiry card.

Drier Timer

Newly improved timer, especially designed and developed for regulating timing cycles of home clothes driers, is said to be "much more dependable, rugged and compact than any other timer of comparable quality." Entire timing device is enclosed.—*Haydon Mfg. Co., Torrington, Conn.*

For more information circle **294** on inquiry card.

MACHINE AUTOMATION

Rotary Parts-feeder

New "No. 160" hopper provides high-speed parts delivery to machine tools; can also be used for sorting, counting and inspection operations; has adjustments to assure best feeding angle; can be supplied with up to four feeding tracks.—*Feedmatic, Inc., 22515 Telegraph Road, Detroit 19, Mich.*

4802

For more information circle **295** on inquiry card.

Parts Counter

New "Model K Impact Counter," capable of counting metallic or nonmetallic parts of any weight or size, is claimed to replace magnetic search coils, photoelectric systems, batch weighing, etc.; will handle rates up to 250 per minute; indicates by six-digit reset counter and neon light. Options include external reset, and pre-set counting to produce a signal at end of

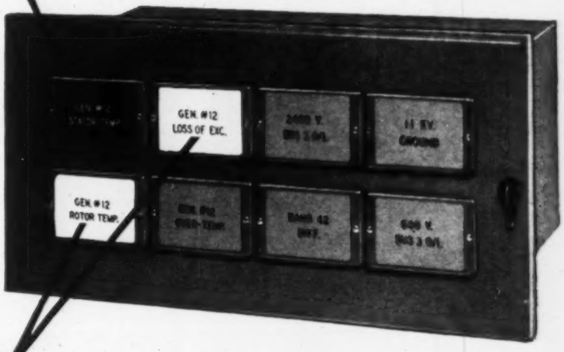
5024

A DOUBLE BARRELLED TROUBLE SHOOTER

PANALARM "50VS"

VISUAL SEQUENCE ANNUNCIATOR*

1 VISUALLY INDICATES
first "off-normal" and subsequent "off-normals".



2 SEQUENTIALLY GROUPS
related variables for easy interpretation.

Troubleshooting in complex processes can be expensive and time consuming. The Panalarm "50VS" Visual Sequence Annunciator *eliminates guesswork . . . pinpoints trouble.* It immediately flashes the cause of trouble; instantly shows resultant "off-normals", and provides a means of grouping and acknowledging related variables so that minimum interpretation is required . . . quick, direct corrective action can be immediately taken.

Your present Universal Panalarm "50" Annunciator System can be changed to provide visual sequence signals. This flexibility prevents obsolescence . . . has made the Panalarm "50" the most versatile audio-visual annunciator available today.

PANALARM "50VS" gives CONTROL INFORMATION

- The primary cause of trouble . . .
- Secondary "off-normals" resulting . . .
- Sequential follow-up of "off-normal" . . .

Send for Bulletin 6-A.
LISTED BY UNDERWRITERS' LABORATORIES

PANALARM
Alarm and Safety Division

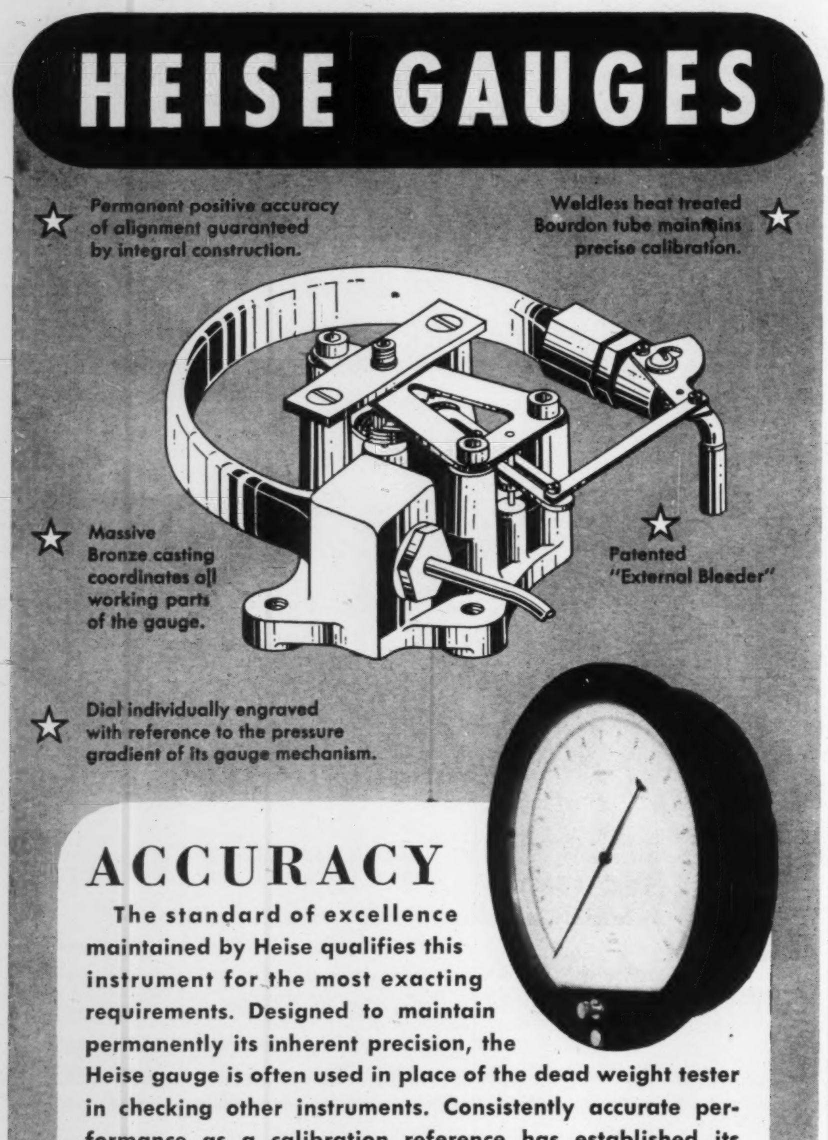
PANELLIT, INC.

7405 N. Hamlin Avenue, Skokie, Illinois

PANALARM
PANELLIT

*U.S. Patent No. 2701872 Copyright 1955, Panellit, Inc.

For more information circle **53** on inquiry card.



HEISE GAUGES

☆ Permanent positive accuracy of alignment guaranteed by integral construction.

☆ Weldless heat treated Bourdon tube maintains precise calibration.

☆ Massive Bronze casting coordinates all working parts of the gauge.

☆ Patented "External Bleeder"

☆ Dial individually engraved with reference to the pressure gradient of its gauge mechanism.

ACCURACY

The standard of excellence maintained by Heise qualifies this instrument for the most exacting requirements. Designed to maintain permanently its inherent precision, the Heise gauge is often used in place of the dead weight tester in checking other instruments. Consistently accurate performance as a calibration reference has established its recognition as THE STANDARD OF THE WORLD.

SPECIALIZATION AND EFFICIENCY

Heise Laboratories have always specialized in the design and production of high precision pressure gauges. The highest standards of quality control protect the manufacture and assembly of each component and the permanent calibration of the finished instrument.

Efficiency in the production of one type instrument, precision pressure gauges, has made it possible to maintain a prompt delivery schedule.

DELIVERY WITHIN 30 DAYS.

Pressure Range 15 to 20,000 P.S.I.
Dial Sizes 8½"—12"—16"
Prices from $151.60

Catalog on Request

HEISE BOURDON TUBE COMPANY, INC.
BROOK ROAD, NEWTOWN, CONNECTICUT, U.S.A.

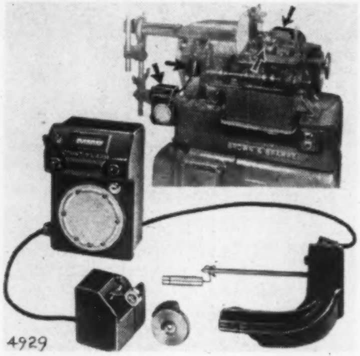
For more information circle **54** on inquiry card.

a given number of counts.—*Control Devices, Inc., 8299 E. 9 Mile Road, Van Dyke, Mich.*

For more information circle **296** on inquiry card.

Machine-tool Monitor

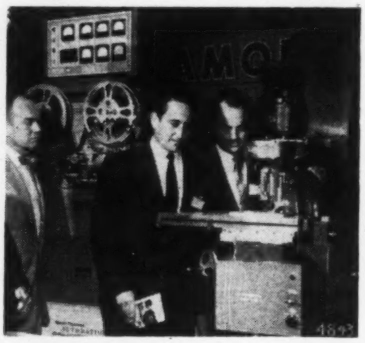
New "Count-O-Larm" (shown applied to a Brown & Sharpe "Model 00") serves a two-fold purpose: (1) it keeps an accurate count of parts produced, but never counts a part that does not measure up to specified length; (2) it gives simultaneous visual and audible alarms whenever machine runs out of bar stock. It is stated that "Count-O-Larm increases machine output by as much as 25 to 30 percent."—*Count-O-Larm Co., 1271 W. North Ave., Chicago 22, Ill.*


4929

For more information circle **297** on inquiry card.

Machine-tool-operation Mag-film-type Controller

New "ACA Electronic Drive" is said to be a simplified process for recording blueprint information directly on magnetic film without making a sample part. Digital pulses are reproduced and amplified to operate synchronous motor differential assemblies. Controlled movement is achieved by varying frequency to one motor in each assembly with respect to a stable reference frequency driving the other. Accuracy to 0.0001 in. is claimed.—*Magnasync Mfg. Co., Ltd., 5523 Satsuma Ave., North Hollywood, Calif.*


4893

For more information circle **298** on inquiry card.

Magnetic Rolls

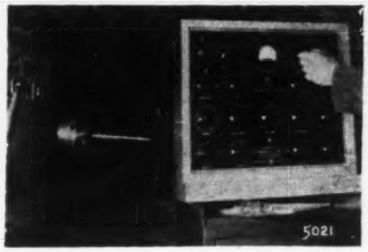
Two new types of small-diameter permanent magnetic rolls: (1) For sheet feeding and conveying, built in

4-in. and 5-in. diameters and widths to 72 in. (2) For spot control in particular conveying problems; two sizes: 2½ in. diam. x 1 3/16 in. wide, and 4⅜ in. diam. x 3½ in. wide. Construction: On a non-magnetic stainless steel shaft, fixed powerful Alnico magnetic elements are arranged to afford maximum depth of field with constant strength around periphery, and are covered by a steel shell to whose smooth surface is applied a 0.002-in. thick hard chrome surface.—*Eriez Mfg. Co., Erie, Pa.*

For more information circle **299** on inquiry card.

Machinability Computer

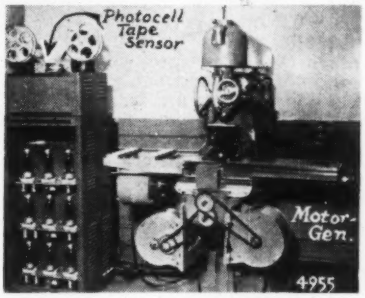
New machinability computer solves problems, which normally take tool engineer several hours to compute, in less than 2 min. It considers 14 operational variables in machining, such as grade of carbide, speed, feed, depth of cut, tool life, alloy, material hardness etc.; and when fed data on any of 13, it will come up with the 14th: or the answer.—*Carboloy Dep't, General Electric Co., Detroit 32, Mich.*



For more information circle **300** on inquiry card.

Machine-tool-operation Tape or Film Controller

New system performs automatic operation of machine tools from information on a tape or other record. Tape or other record can be punched, printed, magnetized, embossed, made conductive, capacitive, etc. Information can be sensed by means of photocells (illustrated), magnetic pick-ups, contacts, capacitors, etc. System is based upon a unique step motor (of company's design) which rotates in small increments and is magnetically locked in position when stopped so that it can be employed as a combined indexing and power device.—*Industrial Controls Corp., 616 Baldwin St., Chattanooga, Tenn.*



For more information circle **301** on inquiry card.

Automatic Gager-sorter

New "Model 143 B-18" is a completely automatic hopper-fed gage, which measures OD of precision ball

KEARFOTT FLOATED RATE INTEGRATING GYROS

KEARFOTT 6.05 x 10^4 FLOATED GYRO

KEARFOTT 2 x 10^4 FLOATED GYRO

Consistently Accurate

Their initial accuracy represented by the random drift is continuously repeated in day-to-day operation.

ANGULAR MOMENT GM.CM.^{2}/SEC.	MINIMUM DETECTABLE RATE	TYPE OF TORQUER	TORQUER LINEARITY FULL SCALE	CHARACTERISTIC TIME	DIMENSIONS	WEIGHT POUNDS
6.05 x 104	.01°/hr.	A.C.Vane	0.17%	.0035 Sec.	3-3/4" Diam. x 6-1/8" long	6-1/2
2 x 104	4.1°/hr.	A.C.Vane	0.1%	.0025 Sec.	2" Diam. x 3-7/8" long	1-3/8

Kearfott 6.05 x 10^6 and 2 x 10^4 Floated Gyros have basic construction features that impart this all-important reliability. The materials used in their construction are of similar coefficient of expansion, thus avoiding mass unbalance due to temperature changes. Displacement information is provided by an extremely linear AC Vane pick-off. Either AC or DC torquers can be provided. Two additional floated rate integrating gyros, one with a 2.5 x 10^6 gm. cm.^{2}/sec. wheel and the second with a 12.5 x 10^6 gm. cm.^{2}/sec. wheel are available. Hermetic sealing provides resistance to extreme environmental conditions.

—Send for Technical Data Sheets

KEARFOTT COMPONENTS INCLUDE:

Gyros, Servo Motors, Synchros, Servo and Magnetic Amplifiers, Tachometer Generators, Hermetic Rotary Seals, Aircraft Navigational Systems, and other high accuracy mechanical, electrical and electronic components. Send for bulletin giving data of components of interest to you.

ENGINEERS:

Many opportunities in the above fields are open. Please write for details today.

Kearfott

A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

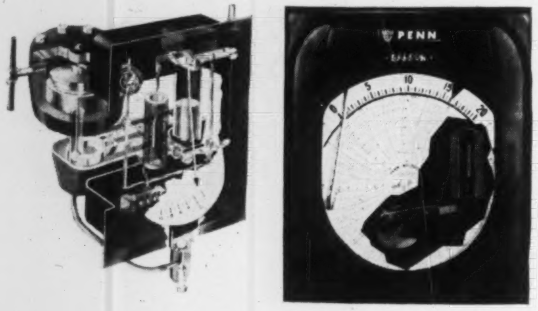
KEARFOTT COMPANY, INC., LITTLE FALLS, N. J.
Sales and Engineering Offices: 1378 Main Avenue, Clifton, N. J.
Midwest Office: 188 W. Randolph Street, Chicago, Ill. South Central Office: 6115 Denton Drive, Dallas, Texas
West Coast Office: 253 N. Vinedo Avenue, Pasadena, Calif.

For more information circle **55** on inquiry card.

MASS

FLOW MEASUREMENT WITHOUT CALCULATION

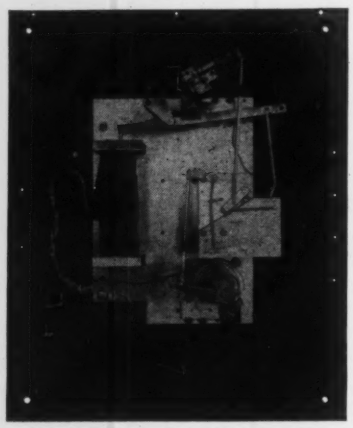
Continuous correction for pressure or temperature variation—or both—is now available with Penn meters. A wide variety of meters permits mass flow readings to be made directly without calculations for indicated or recorded flow rates or for totalized flow.



Penn mechanically compensated flow transmitter with electric or electronic receiver. For ranges of correction up to 4:1.

The famous Magna-Clutch magnetic coupling transmits the float position to the compensating mechanism. This transmitter has a wide range of applications where the total correction ratio required does not exceed 4:1.

For ranges of correction as high as 10:1, Penn features an electrical compensator that makes use of logarithmically wound potentiometers that multiply the indicated flow rate by the correction factor.



Compensation computer for combined pressure and temperature ranges of correction as high as 10:1.

Both mechanical and electrical compensators feature a stable zero. All Penn compensated flow meters are carefully designed to prevent movement in the meter mechanism resulting from variations in static pressure or temperature at zero flow. The meter will record real flow only.

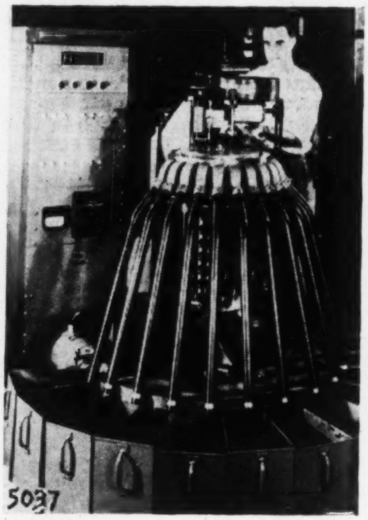
PENN'S broad line of compensated flow meters offers a practical solution to a great variety of problems in the field of "mass" flow measurement. Whether the application calls for pressure, temperature, or combined compensation; whether the range of compensation required is wide or narrow, there is a PENN compensated meter which provides the logical and economical solution to the problem.

Write us today about your flow measurement problems

PENN *Instruments*
DIVISION OF BURGESS MANNING COMPANY
4100 Haverford Avenue • Philadelphia 4, Pennsylvania

For more information circle **56** on inquiry card.

NEW INSTRUMENTS



5037

bearings, ¼ to 17/32 in, and sorts them into 12 good classifications of 0.00001-in each plus oversize and undersize at rate up to 24,000 per hour. —*Federal Products Corp., 1144 Eddy St., Providence, R. I.*

For more information circle **302** on inquiry card.

DIMENSIONAL

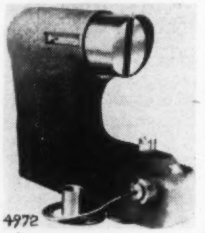
Dial Indicators

4854

New "Emre" 2¼-in. dial indicators are available in 24 models with graduations in 0.0001 in., 0.00025 in., 0.0005 in. or 0.001 in. and with ranges from 0.025 in. to 0.250 in. All conform to AGD specs. "Completely shockproof" movements minimize variance, so that on an indicator with 0.0001-in. graduations, readings are "consistently repeated to 20 millionths of an inch."—*Petz-Emery Inc., Pleasant Valley, N. J.*

For more information circle **303** on inquiry card.

Glass Thickness Gage

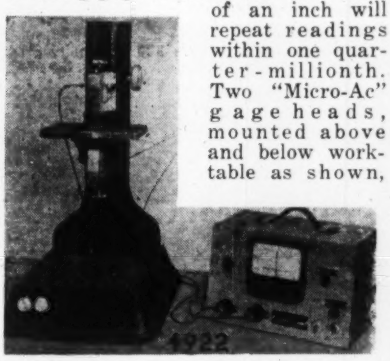


4972

New glass thickness gage developed in Sweden for laboratories is available for production-line checking. Objects to be measured are simply placed over light on instrument: thickness of glass is seen on a screen as a ribbon of light which is measured by reading scale. Defects (and variations in thickness) can easily be seen by turning or moving object being checked. Two models: "Type GT-20" capacity 0.2 in., 0.005-in. scale divisions; "Type GT-40" capacity 0.06 in., 0.001-in. divisions. —*Nife Inc., Copiague, Long Island, N. Y.*

For more information circle **304** on inquiry card.

Microcomparator



New "Opposed-Head Micro-Ac" for checking gage blocks to half-millionths of an inch will repeat readings within one quarter-millionth. Two "Micro-Ac" gage heads, mounted above and below worktable as shown, provide direct calipering of work, obviate need for "wringing" work to an anvil, and assure true size measurement. Capacity 8 in.—*Cleveland Instrument Co.,* 735 *Carnegie Ave., Cleveland* 15, *Ohio.*

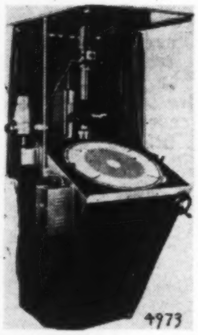
For more information circle **305** on inquiry card.

Depth Gage

New "Mauser Vernier Depth Gage" for die-makers, tool-makers and mechanics is equipped with a 0.001-in. vernier, features instant adjustment to zero and point adjustment. A hardened pin enables operator to measure depth of holes as small as 1/32 in. diam. Small deep holes can be checked by replacing standard pin with a hardened long straight pin. Two models: 3-in. and 6-in. measuring capacity.—*George Scherr Co., Inc.,* 200 *Lafayette St., New York* 12, *N. Y.*

For more information circle **306** on inquiry card.

Contour Projector

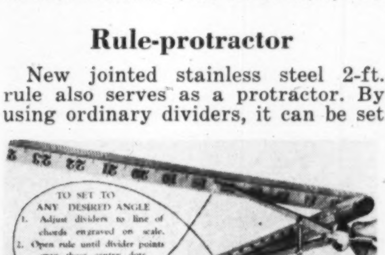


New contour projector designed in Sweden especially for laboratory work obviates need for special contour charts. Enlarged drawings can be made by draftsman working directly on ½-in. thick glass screen without having to compensate for distortion. Accuracy at 100X is 40 to 100 microinches. Many accessories are available.—*Nife Inc., Copiague, Long Island, N. Y.*

For more information circle **307** on inquiry card.

Rule-protractor

New jointed stainless steel 2-ft. rule also serves as a protractor. By using ordinary dividers, it can be set


TO SET TO
ANY DESIRED ANGLE
1. Adjust dividers to line of chords engraved on scale.
2. Open rule until divider points span these centre dots.
For measuring angles reverse operation.
Chords
4729

CHATILLON
ISO-ELASTIC*
the alloy to
remember when real
PRECISION SPRINGS
are needed

Giants of American instrument industry, including such firms as . . .

- Bulova Research & Development Laboratories, Inc.
- Eclipse Pioneer, Division of Bendix Aviation Corp.
- Federal Telecommunication Laboratories, Inc.
- General Electric Co.
- Sperry Gyroscope Co.

and many others think of CHATILLON, when instrument design calls for the "world's most accurate spring".

CHATILLON . . . the leading manufacturer of precision springs is particularly proud of the improved performance record of instruments using the noteworthy CHATILLON developed temperature-compensated alloy "Iso-Elastic". The hysteresis error of this remarkable spring is less than .05% of deflection. Drift does not exceed .02% of deflection in 5 minutes. These characteristics plus temperature compensation insure the ultimate in precision spring production.

CHATILLON makes Extension, Spiral, Torsion, Compression and Form Springs of Iso-Elastic material, as well as springs of all conventional alloys.

To find out how "the World's Most Accurate Spring" can better your product and for engineering bulletins, write CHATILLON SPRING DIVISION.

*U.S.A. Pat. No. 2174171

JOHN CHATILLON & SONS
85 CLIFF STREET, NEW YORK, N. Y.
Manufacturer of Precision Springs and Measuring Apparatus Since 1835

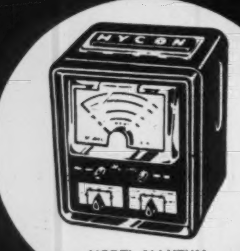
For more information circle **57** on inquiry card.

MORE STAYING POWER
FOR YOUR
TEST SET DOLLAR

Hycon

LABORATORY
ACCURACY
...FIELD-SERVICE
RUGGEDNESS

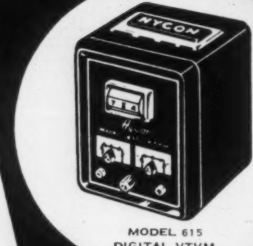
Buy right **today** and know you're ready for **tomorrow's** requirements. Hycon test instruments defeat obsolescence by anticipating — and surpassing — future standards of quality. In addition to the three basic instruments shown, the Hycon line will soon include a 5" oscilloscope, sweep generator, and color bar/dot generator. Write the factory or contact your local parts jobber for additional product information.



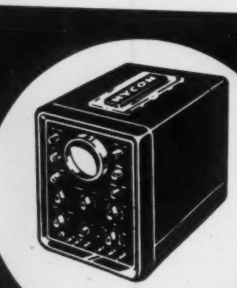
MODEL 614 VTVM

Convenience at unprecedented low cost sums up this rugged, serviceable instrument. Hycon **plus** features include: 21 ranges (28 with peak-to-peak scales); large 6½" meter; 3% accuracy on DC and ohms, 5% on AC; frequency response to 250 mc with accessory crystal probe. **Test probes stow inside case, ready to use.**

Ideal for production-line testing and laboratory work, this new VTVM provides **direct readings** without interpolation. Features illuminated digital scale with decimal point and polarity sign; 12 ranges (AC, DC, ohms); frequency response to 250 mc with auxiliary probe; accuracy: 1% on DC and ohms, 2% on AC. **Cuts multiple scale confusion and learning curve error.**



MODEL 615
DIGITAL VTVM



3" OSCILLOSCOPE
MODEL 617

Designed for both field servicing and laboratory requirements. Features high deflection sensitivity (.01 v/in rms); 4.5 mc vertical bandpass; flat ± 1 db; internal 5% calibrating voltage. Small, compact — but accurate enough for the most exacting work. **Special flat face 3" CRT provides undistorted trace edge to edge.**

ALL INSTRUMENTS
IN MATCHING,
BENCH-STACKING CASES

Hycon Mfg. Company

2961 East Colorado Street
Pasadena 8, California

"Where accuracy counts"

GO NO-GO MISSILE TEST SYSTEMS • AERIAL CAMERAS
BASIC ELECTRONIC RESEARCH • AERIAL SURVEYS
ELECTRONIC TEST INSTRUMENTS • ORONANCE
ELECTRONIC SYSTEMS

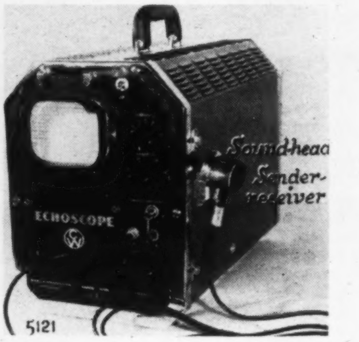
For more information circle **58** on inquiry card.

to any desired angle or, vice versa, any angle can be determined.—*George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y.*

For more information circle **308** on inquiry card.

Multi-purpose Ultrasonic Instrumentation

New "Echoscope" utilizes an ultrasonic echo process. A single head serves both as sender and receiver, and impulses are indicated on an oscilloscope tube. Uses: to measure thickness of objects where only one side is accessible; to detect small internal defects in metal; to calculate the volume of fluid in an enclosed steel tank; and to estimate any local variations due to grain structure, recrystallization, porosity, etc. Metal objects up to 16 ft thick can be scanned for serious or minor defects.—*Industrial and Scientific Products Div., Curtiss-Wright Corp., Caldwell, N. J.*



For more information circle **309** on inquiry card.

Black Granite Parallels

New design of black granite parallels, added to the maker's line, is offered in "Super Accuracy" of 0.00005 in. and also in Commercial Accuracy of 0.00015 in. Sizes from 0.5x1x6 in. to 1.5x3x18 in.; larger sizes to order. Each comes in a leatherette-covered felt-lined plywood case.—*Collins Mirroflat Co., 2326 E. 8th St., Los Angeles 21, Calif.*

For more information circle **310** on inquiry card.

Air Amplifier-gage

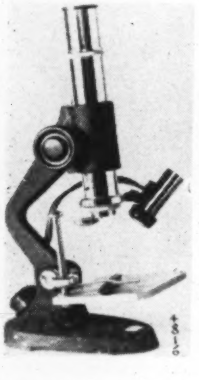
New "Stur-D-Aire Amplifier" is a back-pressure type air comparator whose amplification can be varied. Moreover, it can be set to a predetermined magnification with no change of parts. It enables salvaging worn air gage spindles. Maker claims that "any air gage spindle can be restored to a new or better than new condition at a fraction of new cost."—*Sturdy Tool and Gage Co., 14520 Schaefer Highway, Detroit 27, Mich.*

For more information circle **311** on inquiry card.

More new instrument descriptions in Part Two of this July issue

MICROSCOPES, CAMERAS, etc.

Shop Microscope

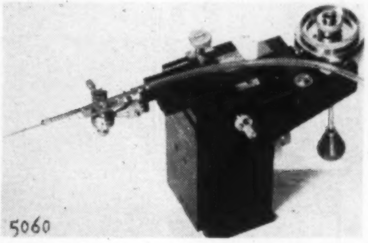


New "Testall" was especially designed for examining surfaces by incident light, has adjustable lamp, also 6-v. transformer. Choice of 5×, 10× or 15× Huyghenian eyepieces or 10× measuring eyepiece; twin objective with swing-out element giving 5× or 10× initial magnification.—*W. J. Hacker & Co.*, 82 *Beaver St., New York* 5, *N. Y.*

For more information circle **312** on inquiry card.

Micromanipulator

New micromanipulator (made by Ernst Leitz, West Germany) features one-hand mechanical control; is so precise that micro-knives, needles and pipettes can be kept within a 0.136-mm field of view during operations on living cells and other specimens; is said to be "completely new in its principle and engineering. Photo shows one of the two sections, which approach the microscope from both sides.—*E. Leitz, Inc.*, 468 *Fourth Ave., New York* 16, *N. Y.*



For more information circle **313** on inquiry card.

Micromanipulator

New "B-D-H Micromanipulator" utilizes thermal expansion of electrically-heated fine wires, has been designed for maximal ease and comfort of operation, is said to be "of unsurpassed precision . . . capable of movements precise beyond the resolution

transistor and
digital computer techniques

APPLIED TO THE DESIGN, DEVELOPMENT
AND APPLICATION OF

AUTOMATIC RADAR DATA PROCESSING,
TRANSMISSION AND CORRELATION
IN LARGE GROUND NETWORKS

Engineers
&
Physicists

Digital computers similar to successful Hughes airborne fire control computers are being applied by the Ground Systems Department to the information processing and computing functions of large ground radar weapons control systems.

The application of digital and transistor techniques to the problems of large ground radar networks has created new positions at all levels in the Ground Systems Department. Engineers and physicists with experience in the fields listed, or with exceptional ability, are invited to consider joining us.

FIELDS INCLUDE

TRANSISTOR CIRCUITS • DIGITAL COMPUTING NETS • MAGNETIC DRUM AND CORE MEMORY • LOGICAL DESIGN • PROGRAMMING • VERY HIGH POWER MODULATORS AND TRANSMITTERS • INPUT AND OUTPUT DEVICES • SPECIAL DISPLAYS • MICROWAVE CIRCUITS

Scientific and Engineering Staff

HUGHES
RESEARCH
AND DEVELOPMENT
LABORATORIES

Culver City, Los Angeles County, California

For more information circle **59** on inquiry card.

BROWN PRESSURE GAGES

Rugged, powerful design. Ample sizing of parts gives liberal overload protection . . . yet provides high sensitivity to small changes without tapping error.

Ranges from vacuum to high pressure. Standard ranges cover the pressure spectrum from 5″ of water to 4,000 psi.

Choice of measuring elements . . . includes spirals, spring and bellows (intermediate and low-range) and dual spring and bellows for absolute pressure . . . all designed for fast, accurate response and long life.

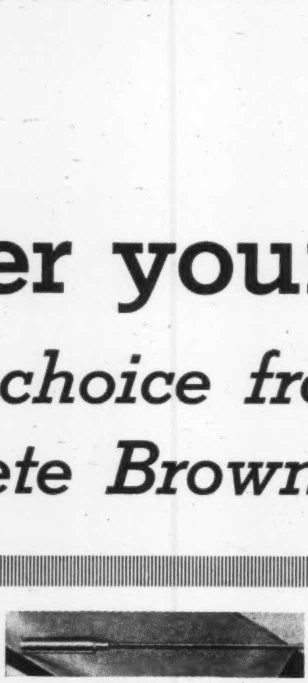
Variety of models. Indicators, recorders (with one, two or three pens) with or without electric or pneumatic control . . . also available as pneumatic transmitters or receivers for remote measurement.

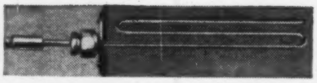
Variety of control actions. Electric control systems include on-off, two-position and three-position with adjustable neutral. Pneumatic control types are on-off, 10% *Throttlor*, *Full Throttlor*, *Air-O-Line* (proportioning-plus-reset) and *Air-O-Line* with rate action.

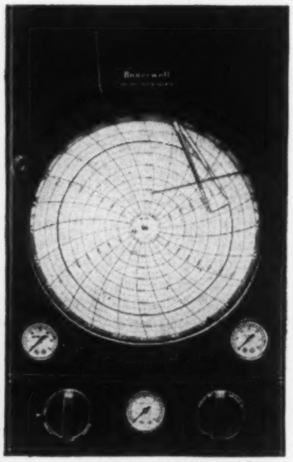
Spiral

Whatever your need

take your choice from the complete Brown line


Regular bulb


Averaging bulb



Air-control recording thermometer

BROWN THERMOMETERS

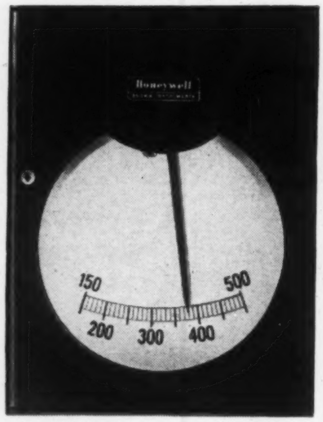
Variety of thermal systems. Mercury, gas and vapor systems cover temperature ranges from —125 F. to 1000 F.

Thoroughly compensated. Gas and mercury systems correct themselves automatically for variations in ambient temperature.

Variety of models. Indicators, recorders (with one, two or three pens), controllers, pneumatic transmitters and receivers, single-unit indicating controllers, and program controllers are available in a choice of standard and special types.

Variety of control actions. Electric control systems include on-off, two-position and three-position with adjustable neutral. Pneumatic control types are on-off, 10% *Throttlor*, *Full Throttlor*, *Air-O-Line* (proportioning-plus-reset) and *Air-O-Line* with rate action.

Variety of bulbs and accessories. A wide selection of bulbs, wells, and tubings of various materials and designs plus related accessories cover a complete range of application requirements.

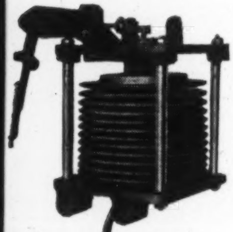


Indicating thermometer

Capillary bulb

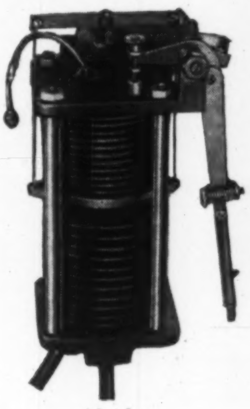
Rigid bulb

For more information circle 60 on inquiry card.

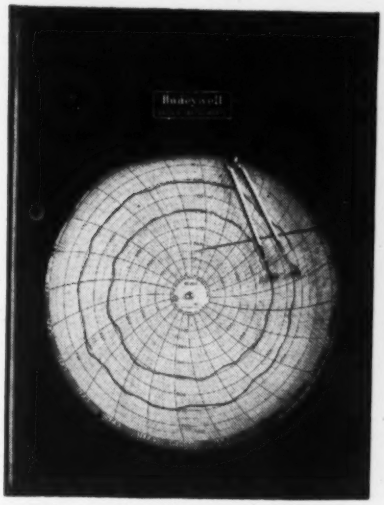


Low range bellows

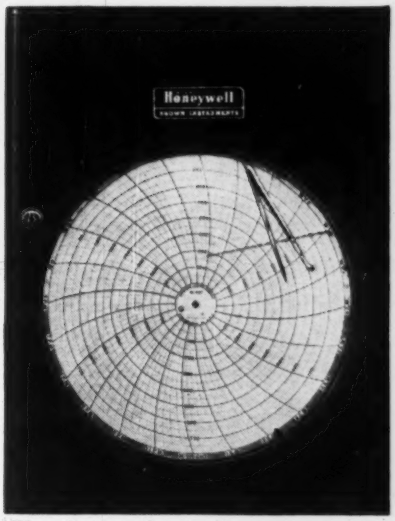
Intermediate range bellows



Absolute pressure unit



2-pen recording pressure gage



Electric control recording pressure gage

for temperature or pressure

WHENEVER production processes need thermometer or pressure gage instrumentation . . . take a look at what Brown has to offer. You'll find an extensive selection from which to choose . . . just about every range, control action and performance feature you could demand . . . at prices that fit any instrumentation budget.

Continued development has brought these rugged, versatile instruments to a high level of performance. They have earned a reputation throughout industry for their ability not only to deliver accurate, sensitive service . . . but, equally important, to stay on the job with an absolute minimum of attention. Behind them stands the long design and production experience of the world's largest manufacturer of controls, and the assurance of prompt, competent service from a nationwide organization of instrument service specialists.

Multiple pen recording models of these versatile instruments are available. They can provide single chart recording of flow and temperature, temperature and pressure, or flow, temperature and pressure, with control on any one of the variables involved.

Ask your local Honeywell sales engineer to talk over your own process problems where these instruments can be advantageously applied. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

● **REFERENCE DATA: Write for Catalog 6709, "Remote Bulb Thermometers" . . . and Catalog 7001, "Pressure and Vacuum Gages."**

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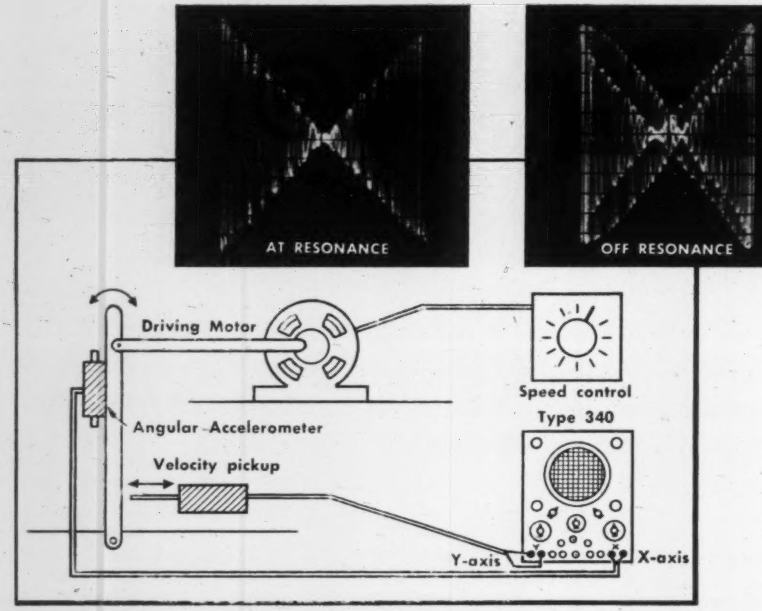
First in Controls

For more information circle **60** on inquiry card.



Identical amplifiers of the new DU MONT TYPE 340 simplify accelerometer test

A problem at the Kearfott Company, Inc. was production testing for natural frequency of an angular accelerometer very near critical damping. They chose the new Du Mont Type 340 as ideal for their measurement since it contains X- and Y-amplifiers which are identical in both phase and amplitude response from dc to 100 kc. In this test, the frequency of the driving force to the accelerometer under test is simply varied and accelerometer output applied to the Y-axis of the Type 340. A velocity pickup measures velocity of drive and its output is applied to the X-axis of the Type 340. At the natural frequency of the accelerometer, its output will be 90° out of phase with displacement or in phase with velocity. Thus, the plot of accelerometer output vs. velocity produces the hourglass waveforms shown above. At resonance, there will be no deflection at the "neck" of the hourglass. Damping has no effect on the test.

The sensitive identical amplifiers of the Type 340 proved invaluable to Kearfott in the successful testing of their accelerometers at frequencies near dc.

- **Identical X- and Y-amplifiers with high sensitivity, dc to 100 kc.**
- **All supply and filament potentials regulated to achieve optimum stability and freedom from line variations.**
- **Hard-tube, highly linear sweeps with beam gate and driven or *recurrent* operation.**
- **New Type 5AQP-Mono-accelerator Cathode-ray Tube assures distortionless presentation.**
- **Price a moderate $335.00.**

DU MONT

TECHNICAL SALES DEPARTMENT
ALLEN B. DU MONT LABORATORIES, INC.
760 Bloomfield Avenue, Clifton, N. J.

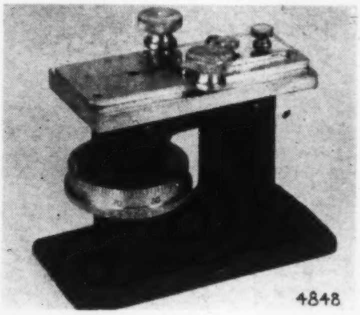
For more information circle **61** on inquiry card.

power of modern optical compound microscopes . . ." Up to four different microtools can be placed in microscopic field at the same time and any selected pair used simultaneously while the other pair are in stand-by readiness. Motions of microtools follow natural (unreversed) directions of hands operating joysticks.—*American Optical Co., Southbridge, Mass.*

For more information circle **314** on inquiry card.

Microtome

New "No. 201" is a new version of maker's "Fiber Microtome"; has an aperture 0.125 in. long by 0.015 in. wide; was developed for sectioning of film, paper, or similar flat material specimens prior to their being attached to specimen slides.—*Mico Instrument Co., 86 Trowbridge St., Cambridge, Mass.*

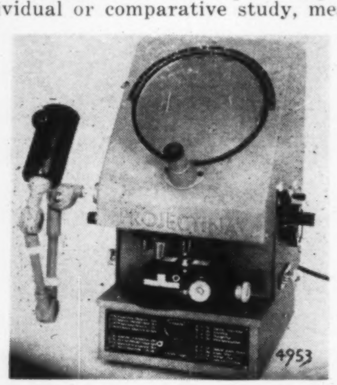


4848

For more information circle **315** on inquiry card.

Macro and Microscopic Viewer-projector-camera

New "Projectina" is a Swiss-made combination instrument providing individual or comparative study, measuring, counting, testing, recording of transparencies and opaque objects through macro (close-up) and microscopic eyepiece viewing, projection (on built-in or wall screen) and photography.—*Karl Heitz, Inc., 150 West 54th St., New York, N. Y.*



4953

For more information circle **316** on inquiry card.

Microscope Accessory for Identifying Minerals

New Accessory Slot Compensator speeds identification of minerals and chemicals by geologists and chemists: first step in identification is to measure birefringence with accessory slot compensator; charts are then used to obtain readings. Determinations correct to 2% without calibration are read directly in millimicrons from a scale engraved on drum: no computations or conversion tables. Instrument performs with maximal efficiency when used with 5890-Angstrom light. An interference filter for use with tungsten illuminators is available to obtain 5890 A.—*Bausch & Lomb Optical Co., Rochester 2, N. Y.*

For more information circle **317** on inquiry card.

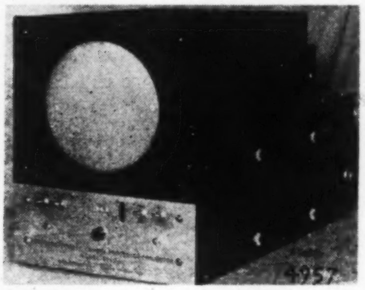
X-ray Camera

New "Super Speed Fairchild-Odelca" 70-mm. photofluorographic camera for medical and industrial x-ray work is a joint development effort with N. V. Optische Industrie of Delft, Netherlands; incorporates recent perfection of Bouwers concentric mirror system. Working aperture *f*/0.8, whereas *f*/1.5 is highest operable lens speed attained by photofluorographic cameras employing refractive lens. Motorized casette (up to six exposures per second) gives complete versatility. —*Fairchild Camera and Instrument Corp., Syosset, L. I., N. Y.*

For more information circle **318** on inquiry card.

Camera-processor-projector

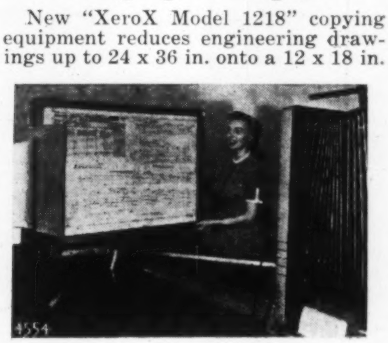
New "Rapromatic Model 4000" incorporates a camera, a photographic processor and a projector. It makes single-frame exposures on 35-mm film, processes them automatically and projects either to its own translucent screen or to a large external screen. With some film materials, pictures can be completed at rate of one per second; cycle never needs to exceed a few seconds. Instrument presents bright images of transient phenomena such as CRT traces, stroboscopic exposures, or single-frame TV; makes visible ultraviolet or infrared images; acts as a light amplifier for x-ray-excited fluorescent screens.—*Kenyon Instrument Co., Inc., 1345 New York Ave., Huntington Station, Long Island, N. Y.*



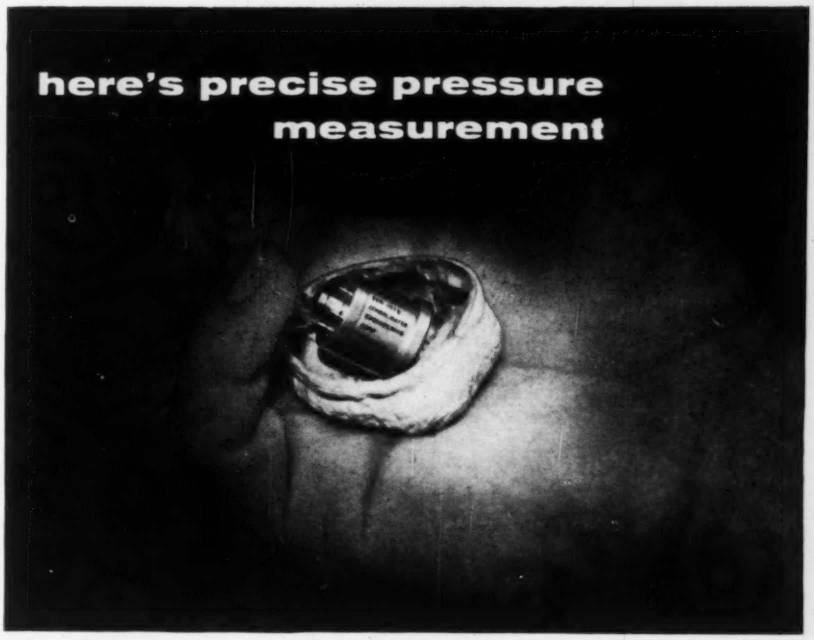
For more information circle **319** on inquiry card.

Xerographic Copier

New "XeroX Model 1218" copying equipment reduces engineering drawings up to 24 x 36 in. onto a 12 x 18 in.



in a nutshell...



What surprises most engineers the first time they see one of CEC's 4-300 Pressure Pickups is its small size. But when they learn of the performance, surprise often turns to amazement. With the 4-300's, there's no compromise on either compactness or accuracy . . . you get *both* in a single unit, with ruggedness that provides laboratory accuracy under the most adverse conditions of use.

For your next pressure measurement job . . . where you need high accuracy, rapid response and minimum size . . . check these important features, common to all CEC 4-300 Pressure Pickups . . .

WIDE CHOICE OF RANGES . . . gage, absolute and differential units . . . full-scale ratings low as 1 psi, high as 5000 psi.

ACCURACY . . . 0.75% maximum linearity deviation...unusually low hysteresis, temperature effects, and acceleration response.

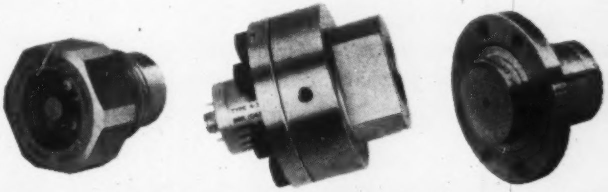
EXTREME MINIATURIZATION . . . bodies as small as ½" in diameter.

STANDARDIZATION . . . same basic sensing element in all models . . . uniform excitation voltage and output greatly simplify system design and operation.

COMPLETE CALIBRATION CERTIFICATE . . . *all* characteristics measured . . . signed certificate sent with each pickup.

ADAPTABILITY...several mounting methods offered . . . standard fittings supplied.

There's a CEC Pressure Pickup for almost every purpose. For complete information let us send you Bulletin CEC 1552-X22.



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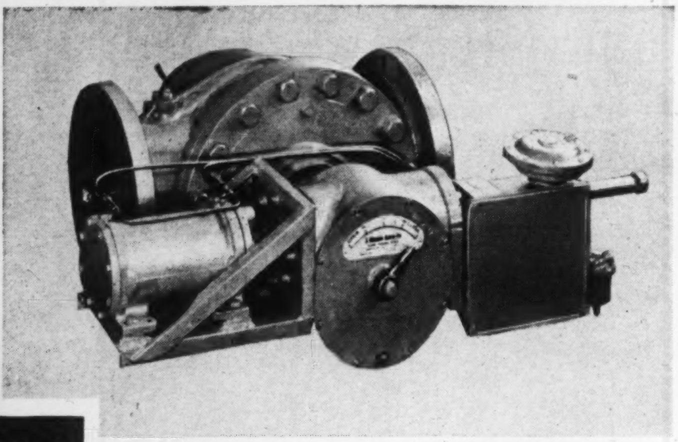

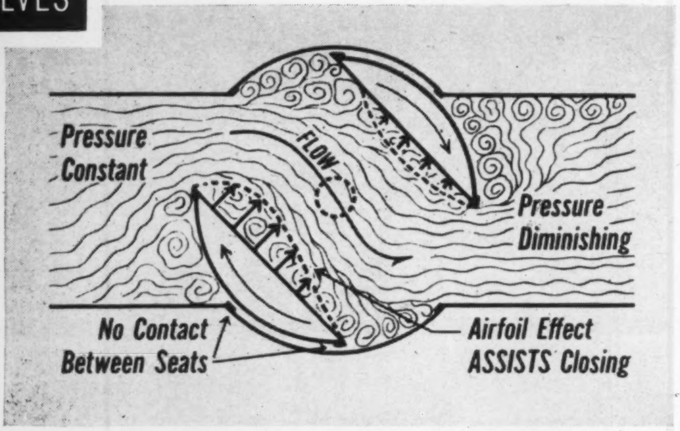

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Hydraulic Imbalance Makes SMS-Rotovalves EASY TO OPERATE

SMS-Rotovalves are easier to open and close. As shown above, hydraulic imbalance creates a strong airfoil effect to help ease closing. Regulation can be fast or slow to suit process needs.

SMS-Rotovalves give complete control in all positions of an extremely wide operating range. Turndown is so great that one Rotovalve can often replace two, or three conventional valves. Pumping costs are cut, for a full open Rotovalve has no more pressure drop than an equivalent length of pipe of the same diameter.

S. Morgan Smith offers you complete valve engineering service. For information on our entire line of cone, ball and butterfly valves and their suitability for the varied demands of your control problems, see your local representative, or write to S. Morgan Smith Company, York, Pennsylvania.

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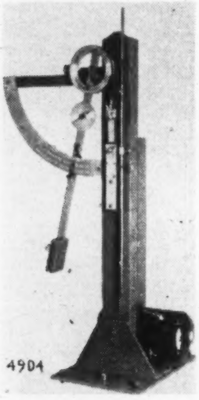
For more information circle **63** on inquiry card.

paper master and makes possible 100 copies in about five minutes "at a new low in production costs." Medium-size drawings can be copied same size. Several small drawings at a time can be copied same-size or enlarged individually to 12 x 18 in. Original masters may be filed for runoff of additional copies when needed.—*The Haloid Co., 2-20 Haloid St., Rochester 3, N. Y.*

For more information circle **323** on inquiry card.

MECHANICAL TESTING AND INSPECTION

Tensile Strength Testers

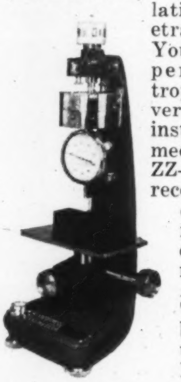


4904

New improved tensile strength testers permit tests to be performed rapidly. No special skill required. Suitable for materials such as paper, twine, wire, aluminum foil, plastic film, tapes, etc. Capacity 25 lbs. Models for heavier capacities available.—*Amthor Testing Instrument Co., 45 Van Sinderen, Brooklyn 7, N. Y.*

For more information circle **321** on inquiry card.

Rubber Hardness Tester



New "Model 650-2 Indentometer (Plastometer)" utilizes known relationships among penetration, hardness, and Young's modulus for a perfectly elastic isotropic material; is a versatile dead-weight instrument designed to meet both Fed Spec ZZ-R-601 and new IOS recommendations; requires less than one minute to change over from Admiralty method to Modified Admiralty method. Test specimens can be immersed in liquid down to −70°F. Direct millimeter readout to fulfill Fed Specs convertible to British Standard, Shore A, or Int'l Hardness degrees.—*Mast Development Co., Inc., 2212 East 12th St., Davenport, Iowa.*

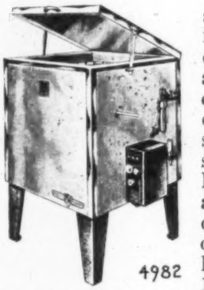
For more information circle **322** on inquiry card.

Cycling Test Chamber

New "Model W-100 FH" has a temperature range of -100°F to 200°F, features extremely accurate automatic temperature control; cycling from -40°F to 185°F in 15 minutes; control designed to hold high temperature for 15 minutes, return to -40°F and remain at that level for same duration before repeating cycle. Unit can be adjusted to cycle temperatures in conformity with all government specifications. Inside dimensions 12 x 12 x 24 in.—*Webber Mfg. Co., 2740 Madison Avenue, Indianapolis, Indiana.*

For more information circle **323** on inquiry card.

Humidity Cabinet



4982

New "Corrosion Test Humidity Cabinet" produces saturated atmosphere with continuous condensation on test specimens; is designed for JAN-H-792 tests; can also be used for other tests requiring extreme humidity at 75 to 150°F. Revolving stage specimen rack, motor-driven at 1/3 rpm, holds 33 test panels. Dual hydraulic thermostat holds temperature within 2 F deg.—*Precision Scientific Co., 3737 W. Cortland St., Chicago 47, Ill.*

For more information circle **324** on inquiry card.

Thermostat Tester

New "Model TT-1" makes possible rapid testing of thermostats for quality control purposes; features a low-heat-inertia test chamber which allows temperature to reach equilibrium rapidly for any test conditions. Temperature can be controlled manually, or automatically by thermostat under test. Up to five small thermostats can be loaded in chamber and tested individually.—*Statham Development Corp., 12411 W. Olympic Blvd, Los Angeles 64, Calif.*

4882

For more information circle **325** on inquiry card.

Thin-sheet Fatigue Testing Accessory

New accessory fixture makes it possible for fatigue properties of sheet stock (metals, plastics, etc.) as thin as 0.010 in. to be determined on "Sonntag SF-2-U" fatigue testing machine.—*Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.*

For more information circle **326** on inquiry card.

Dynamic Hardness and Lubricity Tester

New "Dyhedron" measures hardness and lubricity of metals, glazed tile, glass, carbon, graphite, abrasive wheels and hones, etc. Action of its diamond penetrator differs vastly from that of steel-ball and diamond penetrators: an octahedral diamond works itself into test material by rotating 360° in one direction and 360° in opposite direction, this rotary oscillation being accompanied by a 36° angular progression whereby penetrator changes its stopping position each cycle. At end of test, depth of penetration is read on a precision dial indicator and total number of 360° oscilla-

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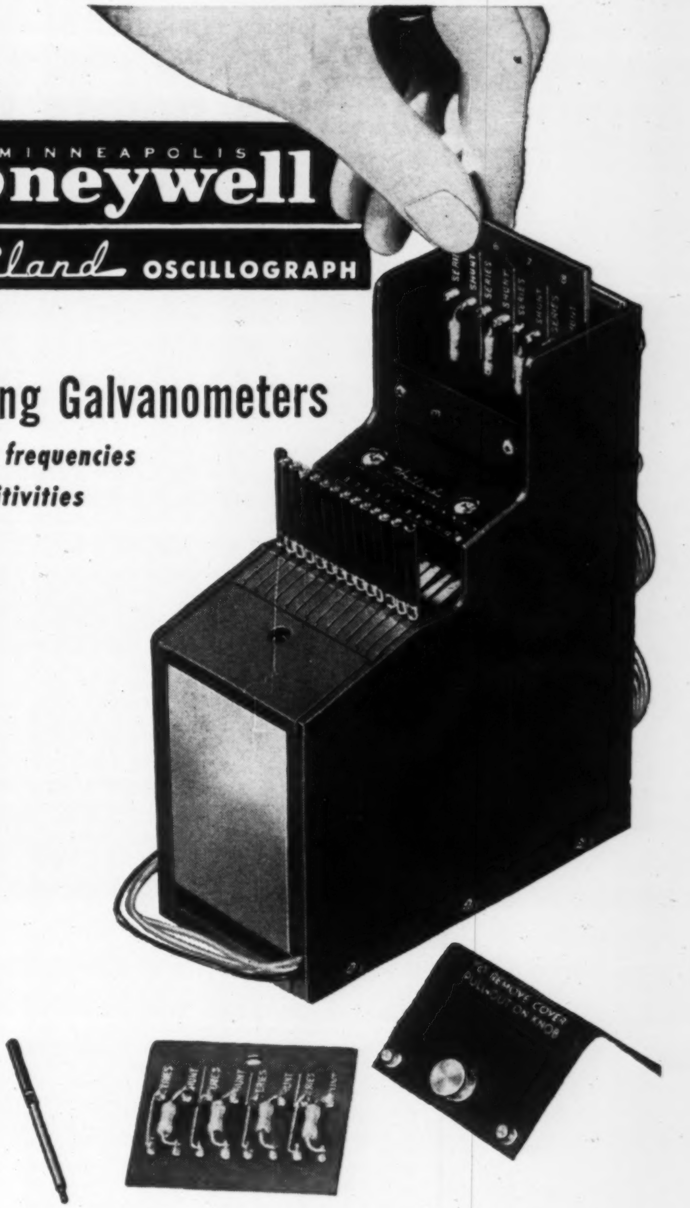
Honeywell
Heiland OSCILLOGRAPH



Recording Galvanometers

with higher frequencies
higher sensitivities

The new Heiland Series 700C Recording Oscillograph gives you an increased number of channels, extended frequency range, greater sensitivities, and operates throughout a broader temperature range because of this new magnet assembly and subminiature galvanometers.

- The series shunt-resistor networks—which with their connectors form a part of the completed magnet assembly—are easy to insert from the operating surface of the oscillograph.
- Galvanometers are available in frequencies as high as 5000 cps, yet they need only 34 milliamperes per inch deflection. The lower frequencies require as little as 4 microamperes per inch deflection.
- For your recording requirements, no matter how complex, select the new Heiland 700C Recording Oscillograph.

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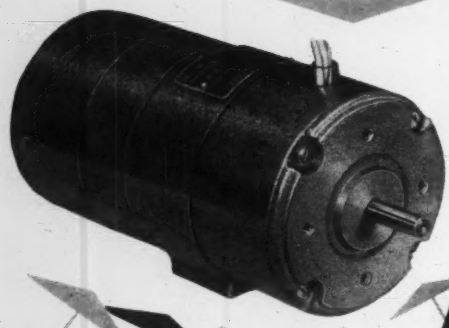

every indication points to

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SELF-SYNCHRONOUS
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indication
and control of

FLUID LEVEL
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POSITION
MOTION
ANGULAR DISPLACEMENT

Cost-saving Elinco Commercial Type Units are right by every indication — just what you need for day-in-day-out use, or for special indicator-control applications — yet you save up to half the usual cost with Elinco —

★*Motors and Generators* for direct "back-to-back" indicator installations

★*Resolvers* for use in torque amplification and servo control systems where extreme accuracy is not required

★*Phase Shifters* where "sensing" must be expressed as a phase relationship

★*Rotatable Transformers* where rotor displacement varies voltage output, for process control and similar applications

FEATURES AND SPECIFICATIONS — Every Elinco unit is a precision instrument manufactured to highest standards, 100% electrically tested, individually balanced dynamically and statically, and carefully produced under step-by-step quality control of all components.

Type	Dimensions	Accuracy	Torque at Max. Phase Displacement	Torque Gradient within ±10° Displacement
Midget	2½" dia. x 3"	3°	2.5 oz. in.	.03 oz. in./deg.
FB	2½" dia. x 4"	2°	4.2 oz. in.	.053 oz. in./deg.
A	3⅜" dia. x 6⅜"	1°	18.0 oz. in.	.28 oz. in./deg.

All above types have 115-volt, 60-cycle primaries, 34-volt secondaries. Special units can be supplied with accuracies, torques, and electrical characteristics to order.

When you specify Elinco Self-synchronous Units, you not only save substantially, but you receive units made by specialists with years of experience producing instrument-type rotary electrical equipment, outstanding for efficient design, precision, and quality. Send us your specifications . . . let us go to work for you now.

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Custom manufactured in a variety of types to meet individual specifications for precision instrument and control applications. Write for catalogs.

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ELINCO

For more information circle **65** on inquiry card.

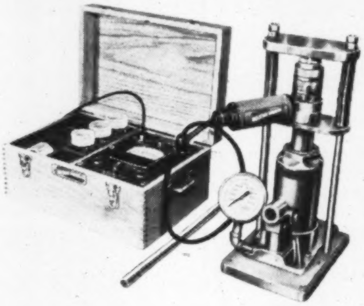
Diamond
Indicator
Counter
5087

tions is registered on a digital counter. Two models: "164-M" for metals and "164-C" for ceramics. Photo shows measurement of strength of bond of a 12-in grinding wheel.—*Taber Instrument Corp., 111 Goundry St., North Tonawanda, N. Y.*

For more information circle **327** on inquiry card.

Moisture Meter

New "G5 Moisture Register" indicates percent of moisture in granular substances, first compressing material for uniformity. Among improvements:

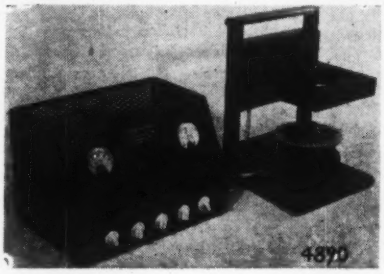


Newly-developed miniature tubes in rf. power absorption circuit result in a more compact, stable instrument giving instantaneous readings as low as 0% in close tolerances. New 3-prong range box virtually eliminates problem of hand capacitance.—*Moisture Register Co., 1510 W. Chestnut St., Alhambra, Calif.*

For more information circle **328** on inquiry card.

Balancer

New "Precision Rotor Balancer" measures unbalance as small as 0.000014 oz-in. and is sensitive to a small fraction of a microinch of vibrational displacement; can rapidly balance gyroscopes, high-speed grinding heads, motors and turbines at all

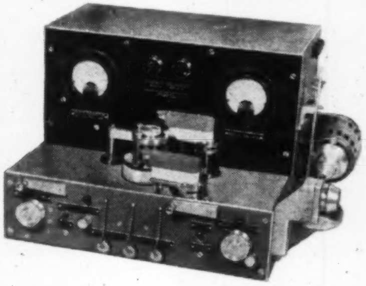


speeds from 1000 to 200,000 rpm. Unbalance indications independent of speed. Spin axis vertical (as in photo) or horizontal.—*M. Ten Bosch, Inc., Pleasantville, N. Y.*

For more information circle **329** on inquiry card.

Balancing Machine

New Dynamic Balancing Machine is capable of measuring and correcting dynamic unbalance of high-speed rotors to "better than one-one hundred thousandth of an inch-ounce."—*Decker Aviation Corp., 1361 Frankford Ave., Philadelphia 25, Penn.*



For more information circle **330** on inquiry card.

Valve Test Stand

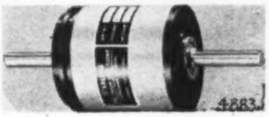
New low-priced semi-portable all-purpose valve-testing station will test any size safety valve including 8x10; also all other types including globe, gate, plug cocks, etc., by means of a novel integral floor manifold unit.—*Farris Engineering Corp., 610 Commercial Ave., Palisades Park, N. J.*

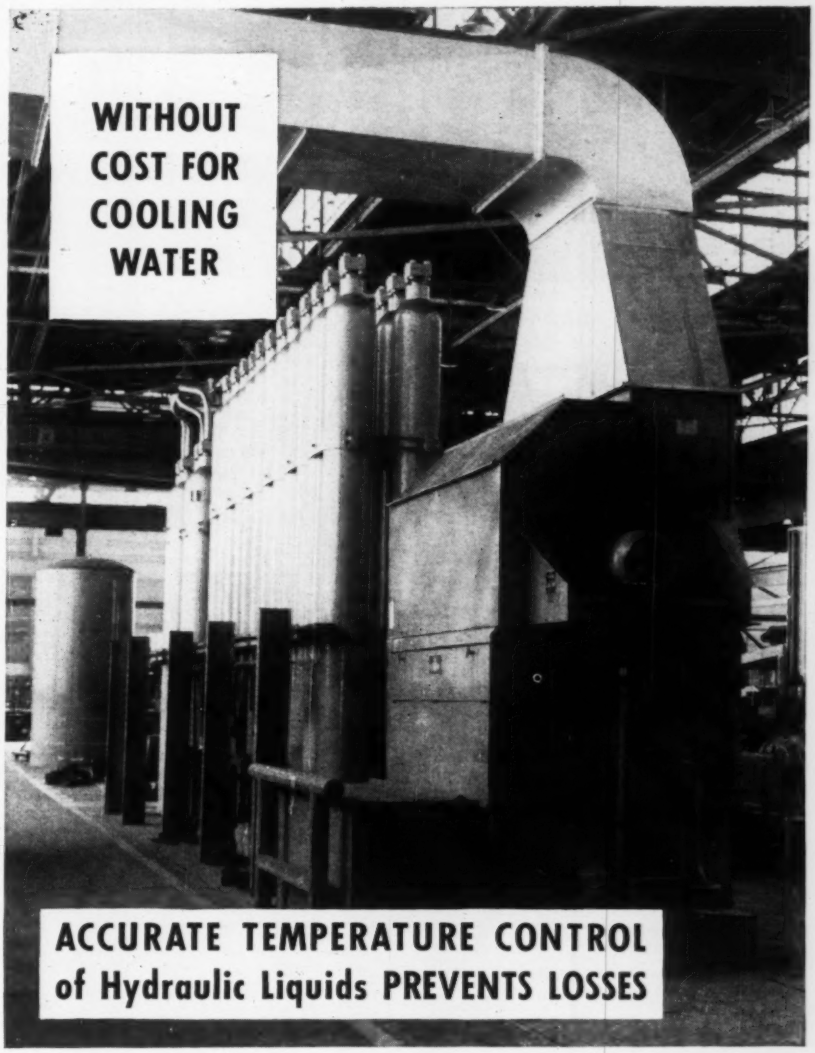
For more information circle **331** on inquiry card.

MECHANICAL COMPONENTS

Magnetic Clutch

New "Model T500," for use in high accuracy computers, servo systems and similar devices, meets all AN-spec environmental and vibrational tests. No angular displacement error upon engagement; input and output shafts magnetically coupled when coil is energized. Mounting is identical to




WITHOUT COST FOR COOLING WATER
ACCURATE TEMPERATURE CONTROL of Hydraulic Liquids PREVENTS LOSSES

● This NIAGARA AERO HEAT EXCHANGER cools the liquid for a large hydraulic press, preventing heat damage to the pump stuffing boxes. Using outdoor air as the evaporative cooling medium, it removes the heat at the rate of input (1,875,000 BTU/hr.) with no cooling water consumption except a negligible amount evaporated.

Air is free and cheaper to move than water. You can save much expense in pumping, piping and power, and quickly recover the equipment cost from the water saving.

Similar Niagara machines cool water, oils, solutions, lubricants and coolants for many mechanical, electrical and chemical processes. You can cool quench baths, welding machines, plastic molds, furnaces, controlled atmospheres, gases, compressed air either for power or instruments or processes. In a closed system, your coolant is never contaminated. The system is simple and easy to keep up; the equipment has a long, useful life. Select from a wide range of sizes up to 30,000,000 BTU.

Write for Bulletin 120 to obtain a complete description.

NIAGARA BLOWER COMPANY

Dept. IN, 405 Lexington Ave. New York 17, N. Y.

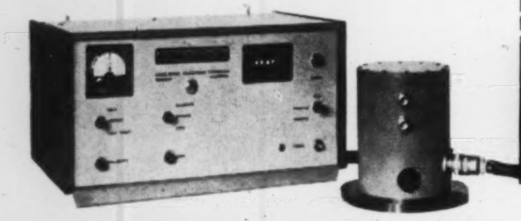
Niagara District Engineers in Principal Cities of United States and Canada

For more information circle **66** on inquiry card.

Direct numerical values.. for precision pressure reading

Eliminate tedious manometer-tube readings from your operations *now!* CEC's *all-electronic* 37-103 Electromanometer equals the mercury manometer in accuracy (0.05% of full scale) and gives you many important advantages. Whenever a fast, accurate pressure standard is required, investigate this new method of measuring pressure. Send today for Bulletin CEC 1547-X6.

- fast response time
- rugged, compact, fully portable
- two readouts: visual digital and 10 volts analog output
- negligible temperature effect
- remote operation: measurements can be telemetered, digitized, recorded
- little maintenance required
- interchangeable pressure heads in 5, 15, 60 and 150 psi ranges can measure gage, differential or absolute



CEC 37-103 Electromanometer

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For more information circle **67** on inquiry card.

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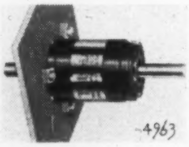
For more information circle **68** on inquiry card.

MK 8 Mod 0 servomotor.—*Sterling Precision Instrument Cor., 34-17 Lawrence St., Flushing 54, N. Y.*

For more information circle **332** on inquiry card.

Speed Reducers



New "Series 106" miniature speed reducers with servo-mount ends come in 448 ratios from 1:1 to 531, 441:1 (special ratios on request); can be either clamp-mounted, using groove and a clamp assembly similar to that shown, or end-mounted, using four tapped mounting holes.—*Metron Instrument Co., 432 Lincoln St., Denver 3, Colo.*

For more information circle **333** on inquiry card.

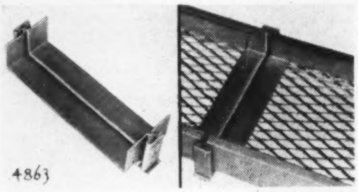
Turns-counting Dial

New "Duodial Series R," 2 in. diam., weight 3 oz., provides 25- and 40-turn count-capacities. Inner dial counts hundredths of each turn; outer dial counts completed turns. Built-in locking device available at small extra cost.—*Helipot Corp. 916 Meridian Ave., South Pasadena, Calif.*

For more information circle **334** on inquiry card.

Coupler for Tubing or Cable Troughs

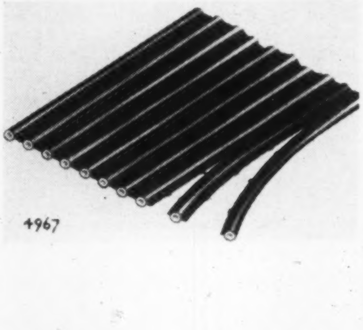
New "Qwik-Lok" saves up to 90% in erection time: obviates need of bolts, nuts and washers; takes one man and a hammer; is for troughs with channel sides (illustrated) or with expanded-metal sides.—*P-W Industries, Inc., 4500 E. Melrose St., Philadelphia 24, Pa.*



For more information circle **335** on inquiry card.

Flat Multiple-tubing Instrument Harness

New "Dekoron M Ribbon" consists of 10 copper or aluminum tubes, each tube individually encased in 0.02-in.



chemically-resistant plastic sheath which is attached to adjacent tubes by a perforated plastic web. Thus one or more individual tubes, or group of tubes, can be stripped from ribbon without tools and without destroying protective coating. Available in lengths to 500 ft; two standard ODs: ¼-in. with 0.030 copper or 0.032 in. aluminum wall tubes, and ⅜-in. with 0.032 copper or 0.035 in. aluminum wall tubes.—*Dekoron Products Div., Samuel Moore & Co., Mantua, Ohio.*

For more information circle **336** on inquiry card.

NUCLEONICS

Remote-handling Tongs

New improved version of "Radiarm, Jr." is 19 in. long, weighs 1 lb, features pistol-type handle offering good leverage and a comfortable grip while handling heavy or light objects held in serrated jaws under spring tension. Accidental dropping of any object is prevented by positive spring pressure requiring a deliberate finger squeeze on trigger for release action. Jaws can be locked into fixed position.—*The Atomic Center for Instruments and Equipment, Inc.,* 489 *Fifth Ave., New York* 17, *N. Y.*

For more information circle **337** on inquiry card.

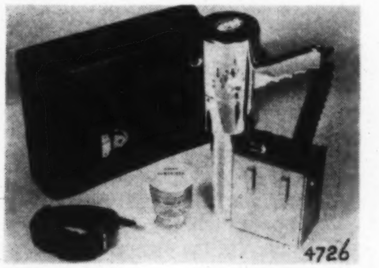
Survey Counter

New "Model GS-3" portable Geiger counter designed for both amateur and professional prospecting, is said to be lighter, smaller, more sensitive, and easier to service than any comparable Geiger counter now available, and to be "free of the touchiness generally associated with portable instruments." Weight 4¾ lbs. with phone and carrying strap; size of circuit box 3 x 3½ x 7 in.—*Nuclear Measurements Corp.,* 2460 *N. Arlington Ave., Indianapolis* 18, *Ind.*

For more information circle **338** on inquiry card.

Scintillation Counter

New "Model 111-B Percentometer" registers directly in percentages of uranium, enabling prospectors to make on-the-spot radioassays. Features: gamma-sensitive crystal 1.5 in. in diam.; conveniently grouped controls, eight-tube operation. Strip-chart recorder can be attached.—*Radiac Co., Inc.,* 489 *Fifth Ave., New York* 17, *N. Y.*



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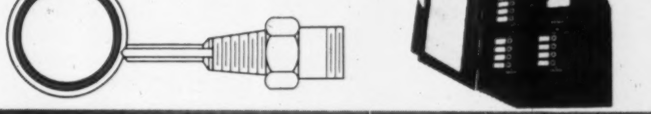
MANY MORE
new instrument descriptions
in Part Two of this July issue
(The 1956 I&A Catalog & Index)

How Omniguard overheat protection can double motor bearing life

Boiler Feed Pump Bearing
Photo courtesy Con Edison
New York



Any way you look at it, Omniguard becomes a necessity for today's high-speed automatic plant equipment. Omniguard signals *instantly* when an overheat condition is near—*before* valuable equipment or processes are harmed.

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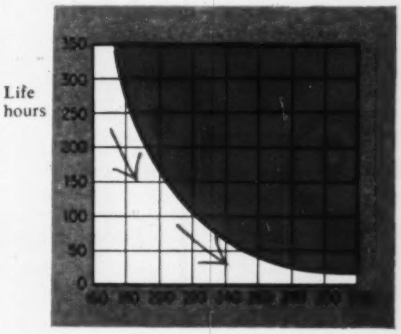
*This study, published in *Electrical Manufacturing,* shows the effects of temperature vs. fatigue life of a tin-base babbitt sleeve bearing at a unit load of 2000 psi.



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Events...

For Other Computer Events see page 1136.

INSTRUMENTS and AUTOMATION

July 25-27
Conference on Systems Engineering, Purdue University, Lafayette, Indiana. For information write John M. Cage, c/o Purdue University.

August 1-12
University of Michigan Summer Session on "Digital Computers and Data Processors—A Report from the Users." For information write John W. Carr, Digital Computation Dept., Willow Run Research Center, University of Michigan, Ypsilanti, Mich.

August 15-17
Seventh National Meeting of the Operations Research Society of America, Hotel Statler, Los Angeles, Calif. For information contact R. A. Bailey, Military Operations Research Div., Lockheed Aircraft Corp., Burbank, Calif.

August 17-19
"The Computing Laboratory in the University", University of Wisconsin, Madison, Wis. For information write Preston C. Hammer, Numerical Analysis Laboratory, University of Wisconsin.

August 22-23
"Electronics and Automatic Production" Symposium, sponsored by Stanford Research Institute and National Industrial Conference Board, at San Francisco. For information, write to the Institute at Palo Alto, Calif.; or to the NICB, 247 Park Ave., New York, N.Y.

August 22-Sept. 2
Summer Program in "Numerical Control of Machine Tools" will be held at Massachusetts Institute of Technology. For information write Summer Session Office, Rm. 7-103, M.I.T., Cambridge 39, Mass.

August 24-Sept. 3
12th Annual British National Radio Show will be held at Earls Court, London, England. For information write Andrew Reid, 11, Garrick St., London WC. 2, England.

August 24-26
1955 IRE Western Electronics Show and Convention, Civic Auditorium, San Francisco, Calif. For information write W. A. Edson, Applied Electronics Laboratory, Stanford, Calif.

August 29-September 2
Fisk University Infrared Spectroscopy Institute, Fisk University, Nashville, Tenn. For information contact Nelson Fuson, Fisk University, Nashville 8, Tenn.

September 12-16
Tenth Annual Conference and Exhibit of the Instrument Society of America will be held at Shrine Exposition Hall and Auditorium, Los Angeles, Calif. For information write Fred J. Tabery, 3443 South Hill St., Los Angeles 7, Calif.

September 14-16
Annual General Meeting of the Association for Computing Machinery, Moore School of Electrical Engineering, University of Pennsylvania, Phila. For information write Sidney Kaplan, R.C.A., Building 13-2, Camden 2, N. J.

September 14-16
Second National Annual Meeting of the Institute of Radio Engineers Professional Group on Nuclear Science, Oak Ridge, Tenn. For information contact H. E. Banta, Oak Ridge National Laboratory, P. O. Box P, Oak Ridge, Tenn.

September 28-29
Conference on Industrial Electronics, Park Sheraton Hotel, Detroit, Mich. For information contact Guido N. Ferrara, 8106 W. Nine Mile Rd., Oak Park 37, Mich.

September 28-30
Sixth TAPPI Testing Conference, Sheraton-Kimball Hotel, Springfield, Mass. For information write Wm. Schoenberg, 1878 East 18th St., Cleveland 14, Ohio.

October 3-5
11th Annual National Electronics Conference, Hotel Sherman, Chicago, Ill. For information write J. Kocek, c/o Illinois Bell Telephone Co., 208 W. Washington St., Rm 300, Chicago 6, Ill.

October 3-6
25th Annual Meeting of Society of Exploration Geophysicists, Shirley Savoy Hotel, Denver, Colo. For information write Colin Cambell, 624 S. Cheyenne, Tulsa, Oklahoma.

October 5-14
Tenth General Conference on Weights and Measures will be held in Paris and Sevres, France. For information write National Bureau of Standards, U. S. Dept. of Commerce, Washington 25, D.C.

October 13-15
Committee on Vacuum Techniques, Inc., will hold their Second Symposium on Vacuum Technology at Mellon Institute, Pittsburgh 13, Penna. For information write Rudy Koehler, c/o Box 1282, Boston 9, Mass.

October 24-25
First Annual Technical Meeting of the Professional Group on Electron Devices of the I.R.E., will be held at The Shoreham Hotel, Washington, D.C.

October 27-28
11th Annual Meeting of National Conference on Industrial Hydraulics, LaSalle Hotel, Chicago, Ill.

October 28-29

1955 Philadelphia ISA Section Symposium "Automatic Control Loops—Electronic or Pneumatic?", at the Penn Sherwood Hotel, Phila., Pa. For information write c/o R. F. Eisele, Leeds & Northrup Co., 4907 Stenton Ave., Phila. 44, Pa.

November 1-5

SRI, Association for Applied Solar Energy and University of Arizona World Symposium on Applied Solar Energy, Westward-Ho, Phoenix, Arizona. For information write Public Relations Dept., Stanford Research Institute, Stanford, Calif.

November 3-4

Eighth Annual Electronics Conference sponsored by the Kansas City Sec. IRE, Town House, Kansas City, Kan. For information write P. O. Box 391, Kansas City 41, Missouri.

November 3-4

Fourth Annual Louisiana Polytechnic Institute Instruments Conference, Ruston, Louisiana. For information write School of Engineering.

November 7-9

Eastern Joint Computer Conference and Exhibition sponsored by AIEE, IRE and ACM, Hotel Statler, Boston, Mass. For information write Box 223, Boston 1, Mass.

November 9-11

Nineteenth Annual Time and Motion Study and Management Clinic, Sherman Hotel, Chicago, Ill. For information write Industrial Management Society, 35 E. Wacker Dr., Chicago 1, Ill.

November 13-18

American Society of Mechanical Engineers' 75th Annual Meeting, Hotel Congress, Chicago, Ill.

November 14-17

Second International Automation Exposition will be held at Chicago's Navy Pier. For information write The Second International Automation Exposition, 845 Ridge Ave., Pittsburgh 12, Penna.

November 16-18

Society for Experimental Stress Analysis meeting and exhibit, Hotel Sheraton, Chicago, Ill. For information write J. J. McDonald, Consolidated Engineering Corp., 919 N. Michigan Ave., Chicago, Ill.

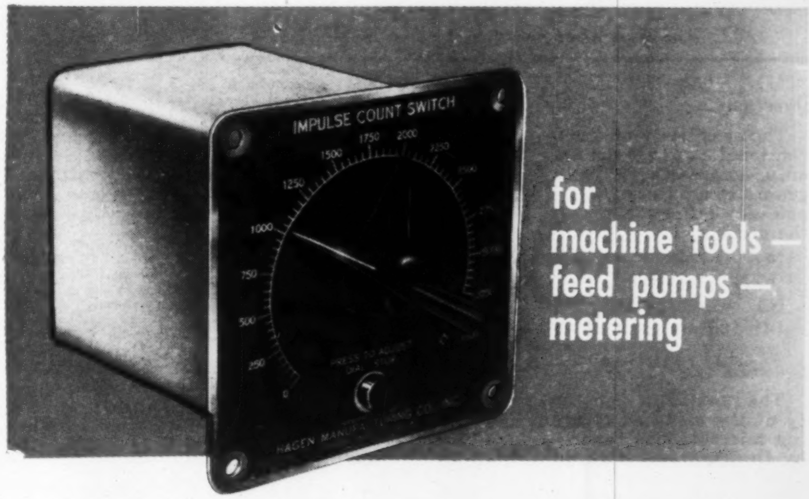
January 9-10

Second National Symposium on Reliability and Quality Control in Electronics, Hotel Statler, Washington, D. C. For information contact V. Wouk, Beta Electric Corp., 333 E. 103rd St., New York 29, N. Y.

January 19-21

Dallas-Fort Worth Chapter of IRE Professional Group on Electronic Computers National Simulation Conference, Dallas, Texas. For information contact J. R. Forester, 2104 Huntington, Arlington, Texas.

HAGEN count switch



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Test Your I. Q. (Instrument Quotient)

See Page 1150 for Answers

All Questions are based on editorial matter in this issue.

Question 1

The sensitivity of a conventional analytical balance, expressed as milligrams weight per inch of pointer deflection, is in the order of

(a) 0.1 mg/inch
(b) 1.0 mg/inch
(c) 10 mg/inch
(d) 100 mg/inch

Question 2

The maximum sensitivity of the modified recording microbalance reported by Dr. Peterson of Mellon Institute, expressed in micrograms per unit division of the recording scale, is

(a) 0.01 ug/div.
(b) 0.1 ug/div.
(c) 1.0 ug/div.
(d) 10 ug/div.

Question 3

A differential equation with dependent variable x is said to be linear when

(a) x and all its derivatives appear to the first power only
(b) x and all its derivatives have constant coefficients
(c) it contains only first- and second-order derivatives
(d) there is no independent variable

Question 4

When a differential equation has only one independent variable (such as time t), the equation is said to be

(a) linear
(b) ordinary
(c) of low order
(d) all the above

Question 5

Main advantage to increasing the scale length of an electrical indicator, without change in the movement, is

(a) increased readability
(b) increased accuracy
(c) decreased response time
(d) all the above

Question 6

ASA Standard C39.1 for Electrical Indicating Instruments states that all current and potential circuits in such indicators must withstand sustained overloads of at least

(a) 10 percent
(b) 20 percent
(c) 50 percent
(d) 100 percent

Question 7

To stay within the limits of ASA Specification C39.1, wattmeters, varmeters, frequency meters and power-factor indicators should be operated at normal voltage and frequency within plus or minus

(a) 1 percent
(b) 10 percent
(c) 40 percent
(d) 100 percent

Question 8

Which of the following statements about damping and response time of electrical indicating instruments is NOT true?

(a) Damping is affected by full-scale adjustment.
(b) It is not advisable to specify a specific damping condition when ordering standard instruments.
(c) Response time is considered in ASA Specification C39.1.
(d) Damping is controlled to exact values in standard instruments.

Question 9

ASA Specification C39.1 gives the operating temperature limits of electrical indicators as

(a) minus 20 to plus 60 F
(b) minus 4 to plus 122 F
(c) zero to plus 100 F
(d) 32 to 132 F

Question 10

Which of the following statements about the effect of environmental factors on electrical indicators is NOT true?

(a) The angle of inclination of the face should be specified.
(b) A steel instrument case provides sufficient shielding from panel effect.
(c) A steel instrument case provides sufficient shielding from conductors carrying current in the vicinity of the indicator.
(d) Lead resistance can affect calibration of d-c millivoltmeters.

Question 11

Telemetering can be accomplished by use of variable-voltage, variable-current, or impulse-type variable-duration signals. An advantage of last type is

(a) simpler circuit
(b) single-wire or wireless transmission
(c) insensitivity to line resistance
(d) all the above

Question 12

Advantage of using tone transmitters in multiple-channel impulse-type telemetering is

(a) simple circuitry
(b) reduced bandwidth requirement
(c) no wire required in transmission
(d) all the above

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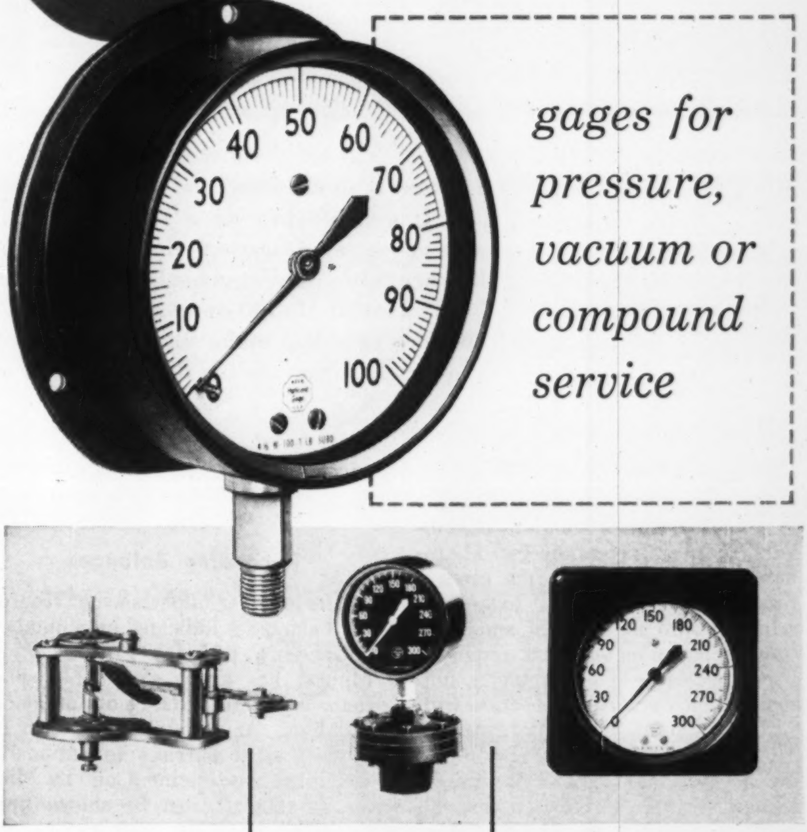

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Analytical Balance + Differential =RECORDING

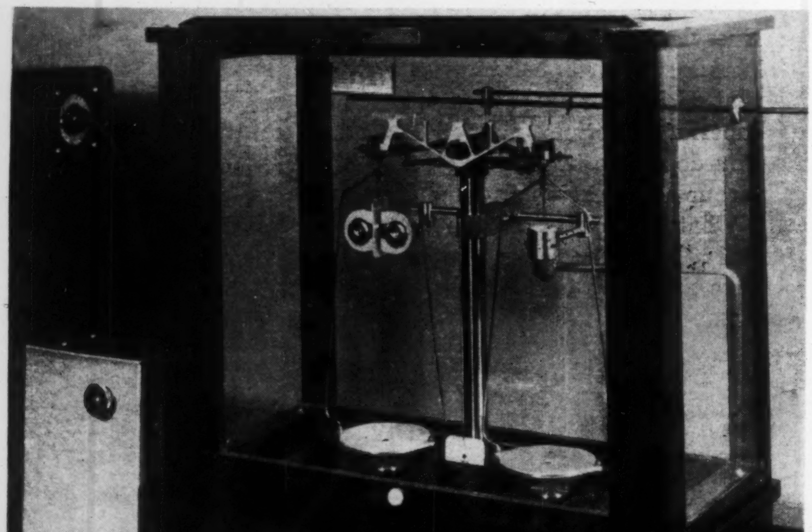
The basic instrument in chemical and analytical research is the analytical balance. Here is a disclosure on a fundamental improvement in this basic instrument—a modification that can be made to almost any analytical balance with only standard equipment, and which increases sensitivity by a factor of 10,000 or more while simultaneously increasing the utility. We are proud to make this first disclosure of a development with revolutionary implications for the entire field of analytical research.

A conventional analytical balance has been modified so it can be used with a standard 1-millivolt recording potentiometer. Microbalance performance (1 mg gives a recorder deflection of 10 inches) is achieved with no external amplification. By use of an auxiliary amplifier, it has been possible to obtain a full-scale 10-inch recorder deflection with 0.01 milligram (10 micrograms). The peak-to-peak noise level is of the order of 0.1 microgram. A differential transformer is used on the balance; a synchronous electromechanical detector converts the 60-cycle voltage to direct voltage. No electronic tubes external to the recorder are used except where greater than microbalance sensitivity is desired.

Recording Balances

The growing importance of recording balances is indicated by a number of recent publications.[1,2,3,4,5,6,7,8] Müller[1] has given a valuable summary on the importance of automatic weighing. At present, there seem to be two main barriers to automatic weighing—one, pointed out by Müller, is that it must be shown how these things can be used with profit. Another barrier is that little equipment is available. Balances listed in the references cited tend to be complex—having a dozen or more vacuum tubes, in addition to the ones contained in the recorder. Also, no unusual sensitivities are reported.

Fig. 1. Recording microbalance is conventional analytical balance plus differential transformer (on right-hand beam); magnetic damper is hung from left-hand stirrup. Small box at left contains non-electronic circuit for demodulation and gain adjustment. Corner of unmodified recording potentiometer can be seen at left.



The balance described here may aid in introducing automatic balances because of its simplicity and sensitivity. No vacuum tubes other than those in the unmodified recorder need be used; by using additional amplification, a 10,000-fold increase in sensitivity of the conventional analytical balance has been obtained.

Principle of Operation

Fig. 1 illustrates the balance. The gaging element is a differential transformer with the core hung from one stirrup of the balance; the coil is supported from the balance post. The aluminum plate of the magnetic damper is hung from the other stirrup, shown on the left in Fig. 1. The addition of a weight causes the balance to deflect and come to rest at a new point. The output voltage due to the displacement of the core is measured as a weight by the potentiometer.

Differential Transformer

The differential transformer consists of an iron core which can move freely in a ceramic cylinder wound with three coils of wire. One winding (the primary) is excited with a 60-cycle current. The iron core couples the electrical energy to two secondary coils, which are electrically connected so that their output voltages oppose each other. Thus, if the iron core is symmetrically located, it induces equal voltages in the two secondary coils and the resultant output voltage is zero. Any displacement of the core from this null position increases one

Transformer + Recording Potentiometer

MICROBALANCE

AXEL H. PETERSON

Mellon Institute
of Industrial Research

secondary voltage and decreases the other, causing an output voltage.

The three-coil transformer, on a solid mount, is shown at the right in Fig. 1. The core, which is ¾″ long by ¼″ in diameter, moves in a ⅜″ hole in the coil. Centering of the core in the hole is not critical because the output is sensitive only to displacement of the core along the axis of the transformer. The linear region of the motion along the axis is plus or minus 0.030 inch. By restricting the motion to about one-half of this linear region, the linearity due to the element is more precise than the linearity of the recorder, which is about 0.2%. The differential transformer is the Model 033S of the Schaevitz Engineering Company.

Electrical Circuit

The excitation voltage supplied to the differential transformer is taken from a 60-cps constant-voltage transformer and is reduced by a resistor to approximately one-tenth of the normal value of 6 to 10 volts. The output of the secondary of the differential transformer is supplied to an electromechanical demodulator, where it is converted to a direct voltage. After passing through a zero- and gain-adjustment circuit, the voltage then is fed to a standard 1.0-millivolt recording potentiometer.

It was desired to use a d-c input because the recorders available are standard d-c instruments, and because other advantages accrue to the use of d-c signals. This required demodulation of the a-c signal from the differential transformer. The demodulation is done by using a chopper similar to the one used in the recorder, but using it in reverse—that is, hooking it up to accept an a-c signal and produce a d-c output.

The demodulator, zero-adjust, and gain-adjust circuits are non-electronic and are housed in the small grey box shown to the left of the balance in Figs. 1 and 2. The sensitivity of the balance is controlled by a precision resistance voltage divider. Calibration of the balance is done by using conventional weights while the balance has reduced sensitivity, and then increasing the sensitivity by the desired factor by means of the precision attenuator (voltage divider).

Balance Characteristics

Many balances were tested and studied in this program. Most of them displayed characteristics similar to the one whose characteristics are discussed here in detail.

The normal sensitivity of the unmodified balance is 10 milligrams per inch of pointer deflection—that is, 1 milligram causes a pointer deflection of 0.1 inch. When the differential transformer is mounted and excited, a slight reaction occurs so that 1 milligram now causes only 0.05-inch deflection—that is, the balance sensitivity is cut in half. However, the 0.05-inch deflection causes 1-millivolt output signal from the transformer, which deflects the recorder full scale, or 10 inches. Therefore, 1 milligram moves the recorder pen 100 times farther than the pointer of the unmodified balance. This gain of 100 is obtained with no external amplification. By using added amplication an additional factor of 100 is obtained,

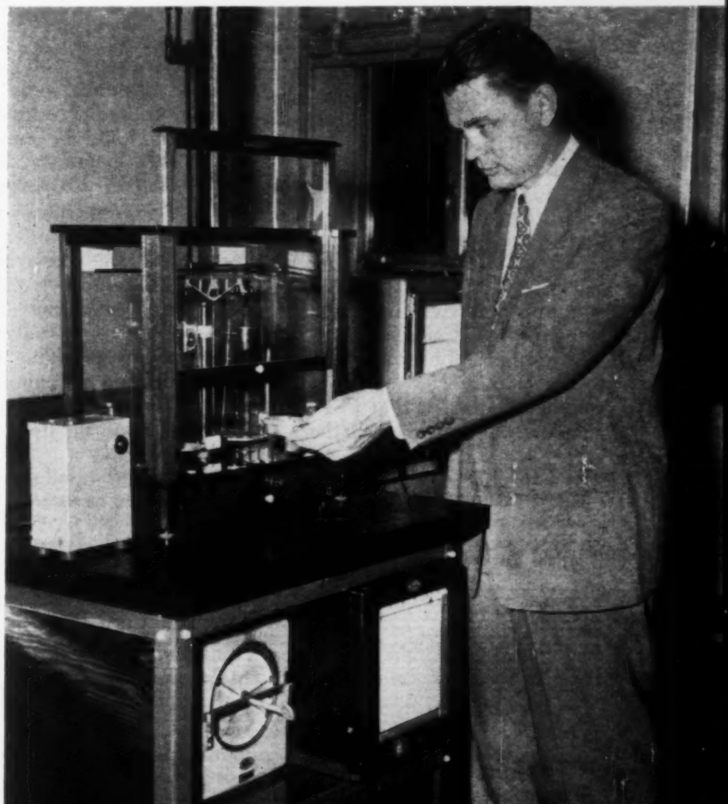


Fig. 2. Pan extension into chamber at lower left permits continuous weighing of materials in various atmospheres and temperatures. This combination of sensitive recording microbalance plus auxiliary chambers and equipment opens exciting new frontiers in analytical research. For example/continuous weighing of microquantities of gases liberated in a reaction has been accomplished by pumping the gases into a special chamber which is being weighed continuously while the reaction is occurring.

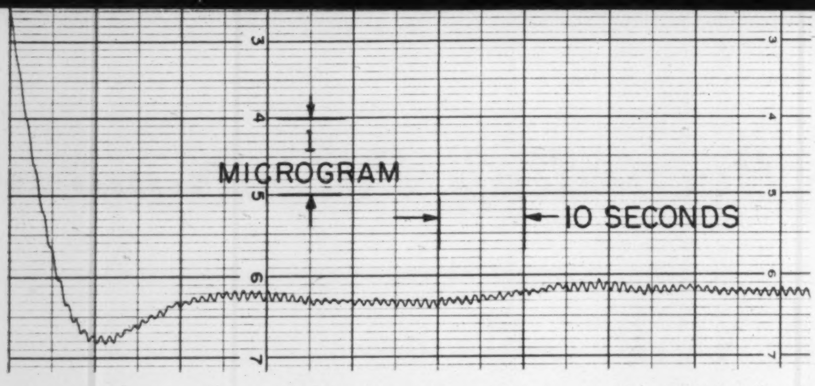


Fig. 3. Performance of the analytical balance with sensitivity increased by 10,000. Full-scale sensitivity is 10 micrograms; balance is loaded with 100 grams; maximum resolution corresponds to line width of 0.01 microgram, or 1 part in 10^{10} of the mass being weighed. Small oscillations are due to pan oscillation, illustrating absence of bearing sticking. Time constant for 63% deflection is less than 10 seconds with the damping used.

giving an over-all increase in sensitivity of 10,000.

The reaction force on the moving core varies as the square of the primary exciting voltage. The normal recommended exciting voltage for the transformer is 6 to 10 volts; however, the transformer is excited with 0.7 volt. Reducing the excitation voltage by this factor of 10 reduces the reaction forces by 100. This is one of the important features that makes the modification successful.

Performance

Fig. 3 illustrates one of the most unusual things discovered in this investigation. This recording was made with a full-scale sensitivity of 10^{-5} gram—yet *no bearing sticking is observable.* The record starts on the left when the pans are released. The oscillations (about 1 per second) are due to slight oscillations of the two pans. The oscillation frequencies are slightly different and beat notes can be observed. These oscillations have a peak to peak value of 10^{-7} gram. If there were bearing sticking, these oscillations would not be apparent. For this recording, the balance was loaded with approximately 100 grams. As the line width of the recording is about 10^{-8} gram, the line width corresponds to one part in 10^{10} of the total mass weighed. It is felt that this performance can be improved further.

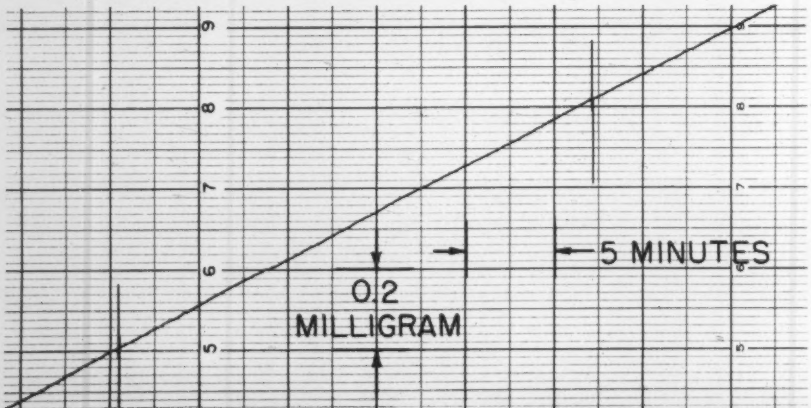
A sixty-cycle vibration is introduced into the beam by the differential transformer. It is possible that this vibration may contribute significantly to the excellent performance by reducing bearing sticking. The vibration is not sufficient to cause the bearings to "walk."

Stability of the order of 10^{-6} gram (1 microgram) per hour has been obtained repeatedly with some balances when run continuously. This stability can be obtained only in locations which are free from building sway or vibration, and which are fairly constant in temperature, pressure and humidity.

Zero repeatability on arresting and releasing the beam and pans has been of the order of 2 x 10^{-6} gram with some balances. Most balances tried were repeatable to 20 x 10^{-6} gram. In continuous weighing, this repeatability after arrestment is of no concern. It should be emphasized again that only ordinary balances have been used in this investigation.

Fig. 4 shows an example of the performance of a balance in measuring the penetration of moisture through a polyethylene film. The full-scale sensitivity was 2 mg., and the total weight on each side of the balance was about 100 grams. This recording was done in the laboratory without any precautions other than keeping the door and windows closed and staying away from the balance. Zero drift for the hour experiment was about 0.5%.

Fig. 4. Continuous recording of weight change due to penetration of moisture through an impervious plastic film, a good example of the possibilities opened by the availability of microbalance sensitivity. Measurements previously requiring days can be made in hours. (Vertical discontinuities result from potentiometer standardization.)



Discussion

Six of the balances studied in this program were between 30 and 40 years old, and some had not been used for many years. Their performance was as good as that of newer balances tried. A twenty-dollar laboratory trip balance gave microbalance sensitivity upon modification; repeatibility, however, was poor. This finding seems to indicate that knife edges are not as critical as has been assumed as far as sensitivity is concerned. The sixty-cycle vibration introduced by the transformer may be a significant factor in reducing bearing friction.

Applications of continuous weighing are being investigated and will be reported in later papers. Some of the possibilities are quite novel, and may demonstrate the importance of continuous weighing.

Acknowledgment

Acknowledgment is due to the Visking Corporation which, through their Fellowship on Film Properties, initiated and, in part, supported the development of this balance; also to Victor Jackman, John Rickert, and Joseph Reiss for their work on the project.

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A Training Program for Open-hearth Fuel Engineers

WILLIAM WHIGHAM, JR.
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SINCE World War II the American steel industry has set an unprecedented pace in expanding its production facilities to meet the needs of a broadening civilian market and the defense requirements brought about by unsettled international affairs. On the first of this year the industry reached a record high level of 117.5 million tons of ingot capacity—a far cry from the 81 million tons of capacity in 1939. Yet increased production has not been attained by construction of new facilities alone.

Not over-looked was the opportunity to get more production from existing facilities. Even 10 percent more output would offset need for building new plants at tremendous cost. The potential is high when one considers that the difference between 12 hours and 9 hours tap-to-tap time amounts to 25 percent change in production.

It became evident that use of fuel while melting the heat was an important factor in shortening tap-to-tap time. This pointed up need for technical assistance to line operators in the Open Hearth. Not enough fuel engineers were available in the plants, and none could be had in the open market. Moreover, engineering seniors in colleges were in short supply, and we could not wait a year or two for a trickle of graduates. Steel and more steel was the watchword, and this meant get the technical help to do it. The answer was to develop a concentrated course on fuel combustion in the Open Hearth.

Course in Open-Hearth Combustion

Some years ago, Carnegie Institute of Technology offered a fine course in Fuel Combustion under an eminent engineer named Willibald Trinks, who has since retired. When the writer explained the open-hearth problems to Webster N. Jones, Dean of Engineering, he cooperated promptly and enthusiastically. Dr. VerPlanck, Head of the Mechanical Engineering Department, was called in to plan the course. He assigned Professors Saylor and Willey to the project. They had taken Professor Trinks' course and both had worked in our mills. This was an ideal combination of knowledge and experience for teaching this course.

A fifteen-week schedule was set up calling for two days a week, divided between classes and laboratory work. A pattern for the other three days in the week was then developed by John J. Golden, Assistant to Vice President, Steel Production, George Krapf, who formerly headed the Power and Fuel staff at Homestead, and the writer. To the Tech classes were added fifteen $\frac{1}{2}$-day classes on construction and design, and fifteen $\frac{1}{2}$-day classes on Open Hearth operating practices. This heavy concentration of classes suggested that much could be gained from planned visits to plant Open-Hearth Departments. A week, then, lines up like this:

Monday	*Tuesday*	*Wednesday*	*Thursday*	*Friday*
Tech	Construction	*Tech*	Open Hearth	Plant
A.M. Class	and Design	A.M. Class	Practice	Visit
P.M. Lab.	Study	P.M. Lab.	Study	

The content of each week was integrated, as far as possible, so that members of the class would see during the plant trip what they had learned that week.

Prerequisites

A significant feature is that the program is designed to require no more than a high-school education. Initially, there was some speculation that those with technical education or an engineering degree would find it too elementary. This was quickly disproved. The initial session started in May, 1951, with sixteen members. The make up of this and later groups is interesting. Ages run from 20 to 45. Education varies from high-school only, to non-technical and engineering degrees. Company service runs from less than a year to more than 20 years. Members came from occupations such as observer, instrument repairman, control technician, junior combustion engineer, utilities analyst, annealer, tester learner, melter foreman, first helper, and management trainees. Some were eligible to union membership; others were salary workers or foreman. One might be inclined to doubt the effectiveness of this course on such a diversified group. But, regardless of age or education, all members gained valuable knowledge and experience from it.

Importance of Training Programs

No longer can a surplus of engineering graduates be hired and kept on routine jobs or in pools awaiting promotional openings. Except as the scarcity of technical manpower forces them to do so, technical staff heads seem reluctant to realize they have a problem of training non-technical or semi-technical people for technician jobs. In our opinion, the answer is to be found through use of concentrated training programs such as described.

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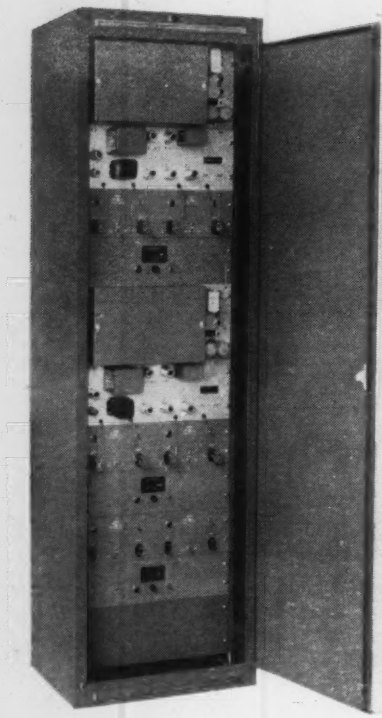

Fig. 1. "Computrol" for punch-machine control.

Industrial uses of

SPECIAL-PURPOSE

Wherever a computing function is required full time, a special-purpose computer may be the economic solution. Examples are given for control of a punch machine requiring computed numbers of various-gage pieces, control of a milling machine for contour milling of turbine blades, and a special-purpose data-processor. Analysis and design of the computer approach is discussed in detail.

POTENTIALLY, there are more applications in industry for special-purpose computers than for general-purpose computers, for a number of reasons. First, a computer used to control a machine, for example, will have a full-time job; it is unnecessary to build general-purpose flexibility into the computer. Second, many computing functions are simple in nature, and it is more efficient to have a number of simple special-purpose computers at the place of application than to have multi-channel transmissions to a computing center.

Digital Computers

Computers are analog or digital in nature. The word digital comes from our ten fingers, and the entire field of desk calculators developed on a count-by-ten principle.

A significant development in the computer art arose from the recognition that counting by tens is awkward for a device with two stable states. A switch may be on or off; a relay energized or de-energized; an electron tube either conducting or nonconducting. Hence great simplication of the computer circuitry was made possible by discarding the decimal system in favor of the dyadic, or binary, system. This approach led to the modern high-speed electronic digital computer.

The binary system is simple. Any number is expressed by the two digits 1 and 0, progressing in powers of 2. For example, the digital number 256 can be expressed in binary form as 100,000,000—which means 2^8, or 256. The most formidable task a digital computer ever is required to perform is to determine either the sum or difference of 0 and 0, 0 and 1, or 1 and 1. It can be seen that it does not require great ingenuity either to understand or to construct a machine to perform these simple tasks. Intelligence is required only to restate the mathematical problem in terms such that it can be solved by a machine that can do nothing more than add or subtract 0 and 0, 0 and 1, or 1 and 1, and to arrange the elements of the machine so that it can perform these fundamental operations at microsecond intervals, without ever losing a single zero or a single one. The digital computer is essentially a simple tool whose prodigious speed makes possible the solutions of problems that men cannot undertake by hand simply because of the time involved.

The Analog Computer

The analog computer performs its operations by setting up analogies for the variables involved, and operating on the analogies. A simple example is the slide rule, in which numbers are represented by distances proportional to the logarithms of the numbers. This is done because multiplication or division of numbers is equivalent to addition or subtraction of the logarithms, and it is easy to add or subtract distances on the slide rule.

Analog computers are designed around many simple physical principles; cams, levers, gears and linkages are used commonly in mechanical computers. Electrical computers use voltages and currents as analogs of pressures and flows. Hydraulic elements also have been used.

The fundamental distinction between digital and analog computers is that the former operate in finite increments; the latter handle qualities that are infinitely variable. Accuracy of a digital computer depends on the number of places to which the calculation is carried; it is limited only by the capacity of the computer. Accuracy of an analog computer is limited by the accuracy with which we can set our quantities and resolve the results.

These differences determine the applications. As a rule (to which there are many exceptions) the analog computer is most efficient where two- or three-place accuracy is sufficient; the digital where higher accuracy is required. There are applications where either serves equally well.

The three general areas of application for general-purpose computers are (1) routine business calculations, (2) scientific calculations, and (3) systems analysis. Each area has different computer requirements—but they do have one requirement in common, which is that the

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COMPUTERS

A. H. KUHNEL

The Austin Company

computer must be flexible in design so that it can be adapted to a variety of problems. It is for this reason that these machines are called general-purpose machines.

Special-purpose Computers

There are circumstances that demand a computer designed for a single purpose to handle only one type of problem. Consider the wattmeter; it indicates a reading proportional to EI cos θ, thus multiplying and calculating the cosine of an angle. The watt-hour meter does this also, and in addition integrates the time integral of EI cos θ.

It would be pointless to design these computers to do other than the desired mathematical functions. Other examples of well-known special-purpose computers are fire-control computers, navigational computers, etc. Wherever a computer is required for one specific task, it is pointless to use other than a special-purpose computer.

Computers That Control

So much emphasis has been placed on computers for mathematical problems, that it is necessary to emphasize the importance of computers that exercise control over processes or information. To point up this distinction, the Special Devices Division of The Austin Company has coined the word "Computrol" to designate their special-purpose computers with control functions.

The fire-control computer mentioned is an example of a controlling computer. It computes with the data from ship's pit log, steering system, gyroscopic stable elements, and radar. Its memory has data on the projectile performance. It solves some interesting mathematics and then controls the pointing of a gun, or torpedo, or missile.

Another special-purpose computer, the "Reservisor" operated by American Airlines at La Guardia Field, handles space reservations for American Airline Flights originating in New York. All available seats for a ten-day period are recorded on a magnetic drum. Sales and cancellations are entered immediately; the number of seats available on any flight can be ascertained in seconds by any clerk.

These examples show typical uses of special-purpose computers for control or data handling. Now let us look at the new industrial applications of special-purpose computers. Our first example is that of a special-purpose digital computer used to control a machine in a factory.

Digital Computer for Machine Control

A manufacturer desires to maintain a stack of 20 motor laminations within close limits of thickness. The 20-piece stack must have a thickness of 0.370 ± 0.002 inch. Hence each piece should have a gage of 0.370/20, or 0.0185 inch; and a tolerance of 0.002/20, or ± 0.0001 inch.

However, he has available only material of 26 gage (0.0188 + 0.001 − 0.000 inch), or 27 gage (0.0172 + 0.001 − 0.000 inch).

If he uses #26, he can obtain a thickness of 20(0.0188 + 0.001), or from 0.376 to 0.396 inch.

If he uses #27, he gets 20(0.0172 + 0.001), or from 0.344 to 0.364 inch.

It is seen that if he uses #26, the best he can hope for (0.376 inch) is 0.004 above his upper limit of 0.372 inch; if he uses #27, the best he can hope for (0.364) is 0.004 under his lower limit of 0.368 inch.

He can meet his requirements by using some of each material—but his machine must run at 100 strokes per minute, with no dead time, if he is to turn out 50,000 units per month. There is no time for manual selection.

Therefore, he conceives of a machine which can be fed alternately from either side. His concept is to feed #26 material from the left and #27 material from the right. Now, if he can devise a means of determining how many times to feed from the left and how many times to feed from the right in a twenty-stroke cycle, he will automatically produce stacks of 20 pieces within tolerance.

He knows that automatic thickness gages are available, or can be designed for his application. But even after he knows precisely how thick each piece of stock is, it is still necessary to calculate the number of pieces of each to be fed. Can an automatic computer do this job for him? It can. The second step is to set up this problem.

Setting Up The Problem

Desired thickness per lamination = 0.0185″.

Range of thickness for #26 = 0.0188 to 0.0198″.

Range of thickness for #27 = 0.0172 to 0.0182″.

Let us set a gage on the #26 stack, and one on the #27. Both gages are set at zero at the desired thickness of 0.0185″ (see top of Fig. 2).

The gage operating on #26 will have a minimum error output of 0.0003″; and a maximum error output of 0.0013″. The gage operating on #27 will have a minimum error output of −0.0003″; and a maximum error output of −0.0013″. Note that the #26 material always produces a positive error, while the #27 material always produces a negative error. Therefore, regardless of how the thicknesses are running, it will always be possible to strike a balance within 0.002″.

Let the deviation for #26 material from nominal (.0185″) equal d.

Let the deviation for #27 material from nominal equal d′.

Let the number of pieces of #26 required equal a.

Let the number of pieces of #27 required equal 20—a.

Then, for zero error:

$$(a)(d) = (20-a)\,d'$$

From which:

$$a = \frac{20\,d'}{d + d'}$$

The third step is to consider computer techniques that are applicable to this case. A computer that can solve the equation for (a) will handle the job.

Computer Approach

There are many approaches to a computer that will solve this simple problem. We must now consider speed, duty cycle, life under environmental conditions, accuracy, and suitability of output for the required control.

We wish to produce 5 units per minute. Since each unit consists of 20 pieces, this requires 100 strokes per minute of the punch, allowing no time at all between units. Aside from computing time between units we also require time to remove each stack of 20 pieces. Yet we do not wish to run our machine too fast or have it idle too long. A speed of 200 strokes per minute is well within the realm of possibility. This speed would permit a maximum of 30 seconds of dead time during each minute and still deliver at the required rate.

As five stacks per minute must be produced, we will have at least 5 computing cycles. If 30 seconds is allowed for 5 cycles, we have a maximum of 6 seconds per cycle. Therefore, our computer must complete a cycle in 6 seconds or less.

The value of (a), for which the computer solves, should be a whole number because we obviously will not be able to cut a fraction of a piece of #26 and make up the balance out of #27. A simple way to control the machine would be to have a counting device that counts the strokes during which we are feeding #26 material until this count matches the output of the computer. Therefore, the computer should have a memory; it must remember the value of (a) long enough so that this number of pieces can be punched. At this point the feed should be transferred to the other side of the machine and punching continued using #27 stock until the total number of pieces equals 20. The same counting device may be used for this purpose.

Since we desire a computer output in the form of a whole number, a digital computer is suggested. The speeds involved are not so fast as to preclude the application of switches and relays. These devices are readily obtainable in designs capable of millions of operations without failure, and their application in industrial control is no novelty. Relays can be used also as memory elements.

From this analysis a device suitable for the application begins to take shape. There are still some questions, however. In our reasoning, we have pre-supposed that it will be satisfactory to gage our two stocks at specific points, compute the number of pieces of each required based upon these measurements, and then run off twenty pieces on the assumption that thickness of the material will not undergo a significant change during the interval. This assumption can be checked easily by looking at the manufacturing process for the sheet stock.

Another point is the gage itself. We must be certain that its inherent accuracy, and our utilization of the output, does not involve excessive errors.

The Gage

Discussion with the manufacturer results in a proposed gage that operates directly on the material. During gaging a hydraulic piston actuates a gage block which forces the material down against a reference block. The material is contacted upon both surfaces over a substantial area so that slight surface imperfections do not introduce any error. The pressure is adjusted to produce a positive reading without distorting the material. The gaging operation takes place when the material is not in motion. When it is in motion it runs clear of the two blocks so that there is no appreciable wear.

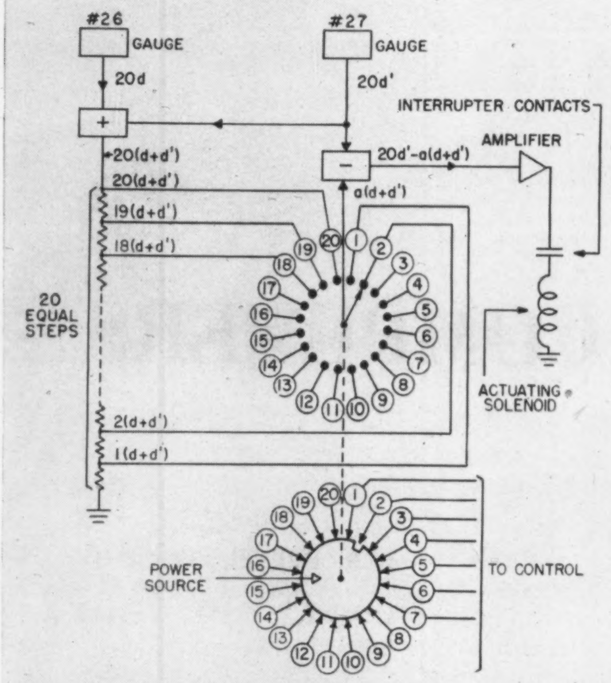

Fig. 2. Computer element for computing the number of pieces of #26-gage and #27-gage stock so that thickness limitation of a stack of 20 laminations is not exceeded. Stock is gaged by gages at top. Sum of signals is divided into 20 equal divisions by resistance divider on top deck of stepping switch. Rotor signal is subtracted from one gage signal, and error is used to operate stepping switch to reduce error to zero. At this point, equation is solved, and correct number of pieces of each gage is automatically determined for the punch machine.

Through a spring-loaded linkage the piston also displaces the core of a linear differential transformer, whose output is proportional to thickness deviation to an accuracy of 1 percent over the full range of 0.001". Our accuracy is therefore 0.00001", or well within requirements. Gaging time is less than 1 second, defined as the time between initiation of the gaging operation and the time at which the output voltage of the differential transformer reaches a stable value.

The output of the gage is a voltage of 2000 cps, with an amplitude of 0.010 volt per 0.0001-inch displacement at the gage. Compared with the outputs of strain gages, for example, this is a large signal.

Two such signals will be available to the computer, the first being proportional to (d), and the second proportional to (d') in the equation $a = 20\,d'/(d+d')$, where (a) represents the number of pieces of 26-gage material in the stack of 20 pieces of 26- and 27-gage stock.

We now have a general approach to a solution, with limiting factors known. We are ready then to proceed with the fourth step, which is to plan the computer.

Computer Design

The two voltages from the gages can be added in a summing network (marked + at upper left in Fig. 2); their sum is proportional to $20(d+d')$.

This voltage can be applied across a divider having 20 equal steps of resistance. Each step would then be proportional to $1(d+d')$, and the voltages appearing at the 20 taps would be proportional to $1(d+d')$, $2(d+d')$, and so on up to $20(d+d')$. These taps can be connected to the twenty points of one deck of a twenty-point stepping

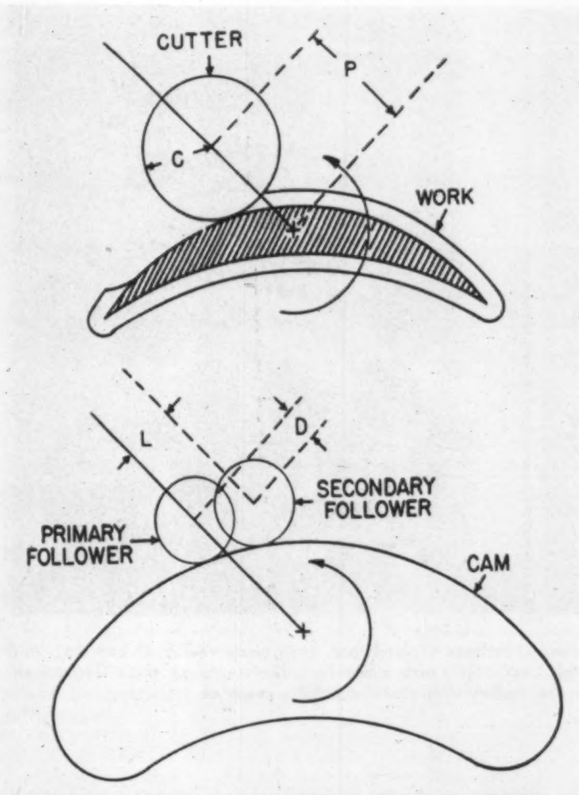

Fig. 3. Problem in contour milling of a turbine blade is that feed rate must be adjusted as work is rotated. Desired feed rate is maintained by special-purpose controlling computer by setting controls for feed rate, base circle radius of cam (B), and radius of cutter (C).

switch. Since (a) must increase by whole numbers from 1 to 20, we can obtain from the rotor a voltage proportional to a $(d+d')$, where (a) varies between 1 and 20 in increments of 1.

Now let us subtract this rotor output—$(a)(d+d')$—from the gage on the #27 stock, whose signal can be expressed as $20d'$. This is done in the box marked with the minus sign at the upper right of Fig. 2. The signal from the subtraction network is:

$$20d' = a(d+d').$$

This signal is rectified and amplified, and supplied as the voltage required to actuate the stepping switch. If this supply is fed to the actuator through its own interruptor contacts, it will cause the switch to step around until the error is reduced to zero—that is, to balance the equation. When this occurs:

$$a(d+d') = 20d'$$

which is the equation to be solved. The position of the rotor then indicates the number of pieces of #26 stock that is required in the stack of 20 pieces of mixed stock.

The amplified error voltage must be large enough, and the output impedance of the amplifier low enough, so that there is enough power to drive the switch. This requires that the amplifier have a sharp cut-off at a signal level where the error is below the value of one increment of (a). We must also provide a control deck on the switch, which could be a rotor with a notch at position (a). Thus power supplied to this rotor would be available on all leads except that corresponding to the computed value of (a). This control deck is shown at the bottom of Fig. 2.

A switch on the machine, which closes at every stroke, can be used to drive a second stepping switch until it matches the position (a) on the first switch, at which point the transfer to the other stock feeder is made. However, these are circuit details familiar to any designer of controls, and it is not necessary to describe them fully.

Checking Performance

The fifth step is to check the performance of our proposed computer with required performance. We allow 1 second for the operation of the gage. Stepping switches are available that operate at 30 steps per second. No more than 20 steps are ever required in a cycle. Thus a maximum time of 2/3 second is required after the gage voltages are available to compute the value of (a). At this point it is possible to start the feed.

At 200 strokes per minute, it requires 6 seconds to punch 20 pieces. Two seconds are required for gaging and computing. This should also be enough time to remove the stack from the machine. Therefore, the production rate becomes one stack in 8 seconds, or 7½ stacks per minute. As our minimum requirement is 5 stacks per minute, we have an adequate margin for any shutdowns that may be required for replenishing stock, replacing dies, and so on.

Economics of the Situation

The cost of design and manufacture of such a computer and control system, which we call a "Computrol," would run between $10,000 and $20,000. This would include all services—the original analysis, the examination of alternatives, and the selection of the most suitable approach and most satisfactory components. It would also include installation, spare parts, and instruction of the operator.

The production rate made possible by this computer is 7½ units per minute, or 450 per hour, or 3,600 per eight-hour day. Assuming an average of 21 working days a month, this makes 75,600 units per month. Suppose this is reduced by 10 percent for normal maintenance and service of the machine; the rate is still 68,000 units per month.

What would it cost to sort the individual pieces according to thickness and count out the stacks by hand? The manufacturer in question calculated that, even with an optimum setup, he would be fortunate to come up with a standard time of 30 seconds per stack. This would work out to about 600 man-hours a month, which admittedly, is optimistic. The cost would be in the order of $4,000 per month.

We conclude, therefore, that the cost of the "Computrol" will be amortized in three to four months. Unless production is to run for a shorter time than that, we have a paying proposition. If production is expected to run for a year or more, we have a profitable investment.

Summary of Case History

To summarize this case history, we have taken the following steps:

1. Stated the problem.
2. Set up the problem for computer operation.
3. Considered applicable computer techniques.
4. Planned a proposed logical computer design.
5. Checked proposed characteristics against desired characteristics.
6. Checked the economy of applying the computer.

As the conclusions are more than favorable, let us look at the result.

Fig. 1 shows the complete unit as it would look in the plant. The cabinet has a simple, plain front. It contains two identical units because there are two identical machines, each controlled by its own computer. Note that the input portion of this computer employs analog techniques, whereas the output portion employs digital techniques.

Analog Computer for Machine Control

We shall now briefly describe an analog computer that controls a milling machine. The problem to be solved in this case was considerably more complex than the one described previously.

The machine to be controlled is a contour milling machine, designed to perform the finish machining of parts such as turbine blades or buckets. The operating principles of this proposed machine must be briefly described so that the control problem can be appreciated.

The machine is designed to handle eight identical parts simultaneously. Eight work spindles to hold these parts are arranged in a circle around the periphery of the machine. At the center of this circle is a ninth spindle on which a three-dimensional cam is mounted. The nine spindles rotate in unison.

There are eight milling cutters, one operating on each of eight cutter spindles. These spindles are mounted on eight cutter heads that are carried on slides arranged radially around the machine.

A separate head, similar to the eight cutter heads, carries a cam follower. This ninth head feeds down in unison with the eight cutter heads.

The result of this arrangement is that the cam follower traces a spiral over the surface of the cam, beginning at the top and feeding down to the bottom, or root. The follower is displaced by the action of the rotating cam, thus running in and out in a radial direction. The ninth head follows this displacement, its hydraulic piston causing it to move in and out under the control of its servo valve. The in-and-out motion of the ninth head is sensed by transducers in each of the eight cutter heads. These transducers generate signals which are amplified, controlling the eight servo valves that in turn control the eight hydraulic pistons that move the cutter heads in and out of the work. The cutters follow the same pattern on the work-pieces that the follower traces on the cam. Thus the cutters reproduce in the work the contours of the cam.

Up to this point, it would appear that we have an automatic machine controlled by servomechanisms that are actuated by the cam follower. The necessity for a computer is not immediately apparent.

The picture changes when we consider feed rate, or chip load. Let us consider the cam and the work spindles to be turning at a uniform angular velocity, and that we are milling a turbine blade (Fig. 3). These blades have a curved slender crescent-shaped cross section, with rather sharp leading and trailing edges. Consider such a shape to be rotating on its longitudinal axis at uniform velocity. The cutter, running on the surface, and travelling in and out on a radial through the center of rotation of the work, contacts the work at successive points whose locus is the finished contour desired. The feed rate, or advance, will be the rate at which the point of instantaneous contact with this locus travels along the locus.

It can be seen that with uniform angular velocity of the work, this feed rate is anything but uniform. The contact point actually dwells at the tip or edge of the blade for the time required to turn the blade through an angle in the order of 90 degrees. During this time the feed rate is approximately zero. On the other hand, when the cutter has rounded the tip and entered the concave portion of the profile a point is reached at which, during only a few degrees of work spindle rotation, the cutter plunges into full engagement. At this point the feed rate is enormous, and for certain combinations of profile and cutter diameter, will approach infinity.

This is an impossible condition. One cannot achieve a finish of uniform quality in this manner, even assuming that the cutter and the machine could stand up under the forces produced. Therefore, it is mandatory to provide some form of automatic control to correct this condition. Uniform feed rate can be achieved by continuously varying the angular velocity of the work spindle.

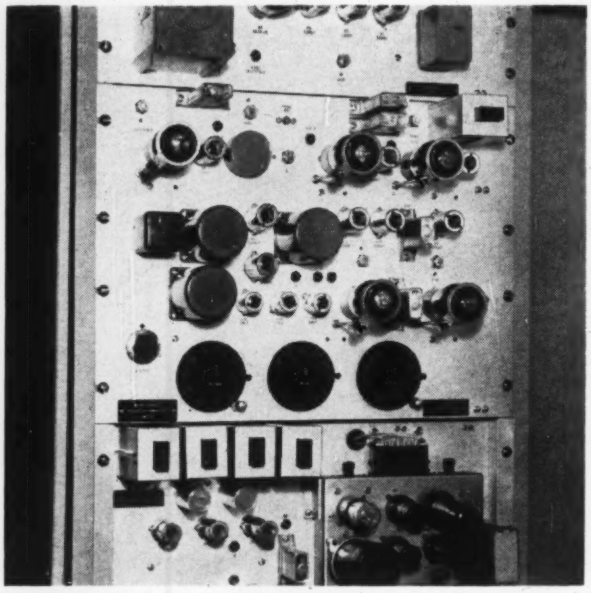

Fig. 4. Settings of feed rate, base circle radius of cam (B), and cutter radius (C) are made by adjustments on this "Computrol" for the multi-station contour milling machine.

Geometry of the Feed-rate Problem

An analysis of the geometry of the problem (Fig. 3) developed the equation

$$\dot{S} = \dot{\theta}\,(\sec\phi\,P - C) - C\dot{\phi}$$

where $\sec\phi = \sqrt{\tan^2\phi + 1}$

and $\tan\phi = [(P+B)/P]\,[D/L]$

$\dot{S}$ = instantaneous feed rate (in/sec); $\dot{\theta}$ = work spindle velocity (rad/sec); ϕ = slope of work surface at cutter contact point (rad); $\dot{\phi}$ = rate of change of ϕ (rad/sec); C = radius of cutter (inches); P = instantaneous distance between center of cutter and center of rotation of work; B = radius of base circle on which cam was constructed (inches); D = radial displacement of secondary cam follower (inches); L = lateral displacement of secondary cam follower (inches).

In the above equation it is desired to keep $\dot{S}$, the feed rate, constant by varying θ, the angular velocity of the work spindle.

An analog computer has been designed to perform this essential function. Fixed inputs to this computer that are preset when the machine is set up for a given job are $\dot{S}$ (desired feed rate), B (base circle radius for cam used), and C (radius of cutter used). These adjustments are shown in Fig. 4.

P and D are sensed by transducers built into the machine. Present $\dot{\theta}$ is sensed by a tachometer geared to the work-spindle drive system.

With these inputs, one set fixed during setup of the machine and the second set generated by the operation of the machine itself, the computer continuously balances the equation by producing an error signal that causes either accelerations or deceleration of the work spindles

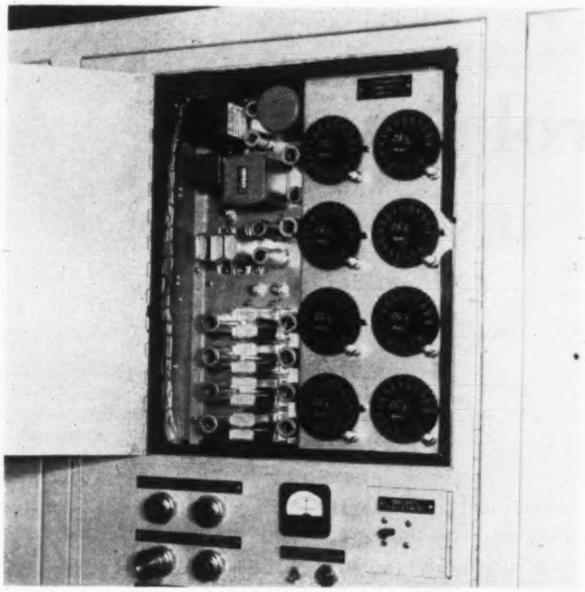

Fig. 5. Problem of variable cutter radius in multi-station contour-milling control is met by computing circuit. Eight multipliers shown are for the eight cutters used. By setting each multiplier, eight pieces are produced to exact dimensions, despite differences in cutter radius.

through a servomechanism that controls a variable-displacement pump.

After a number of pieces have been run through the machine, cutters become dull and require grinding. This regrinding reduces cutter radius. An analysis of the geometry of this problem developed the equation

$$P_c = \Delta C \sec \phi$$

where P_c equals the distance in inches by which the radial position of the cutter head must be offset to compensate for a change of Δ C in cutter radius from that for which the cam and follower were calculated. A simple multiplier is added to the computer that can multiply the term sec ϕ by ΔC, automatically correcting operation of the machine for changes in cutter radius resulting from the grinding of cutters.

Eight such multipliers have been provided (Fig. 5). Each is a potentiometer with the dial calibrated for the manual setting of Δ C. This feature provides a tremendous advantage in the application and operation of the machine, for cutter selection and matching is not required: even when eight cutters have eight different radii, all pieces will be produced to duplicate the contour of the cam within the inherent precision of the machine.

Data Processing

Brief reference should be made to special-purpose equipment employed in data processing. We have designed a "Datatrol" (a device called rather loosely an Automatic Data Recorder) which is a special-purpose equipment developed for a particular data processing job—the recording on a common time base of the instantaneous positions of a number of rotating shafts, and to produce this record in a form suitable for subsequent automatic analysis by a programmed digital computer.

The rotating shafts are in groups of three. That is to say, the positions of three rotating shafts must be sensed simultaneously. There are five such groups of three shafts. A simultaneous sampling must be taken from specified groups of three at intervals of precisely one tenth second. The positions of the various shafts must be sensed to an accuracy of one four-thousandth part of a revolution at shaft velocities ranging from 0 to 2 revolutions per second, and at shaft accelerations ranging from 0 to 1/3 revolution per second per second.

A shaft-position quantizer is coupled to each of the shafts. The three quantizers of a group are read out simultaneously. The positions of the three shafts, digitized by the quantizer, are stored in binary-coded decimal form in three banks of counters.

The sampling intervals are generated by use of a fixed-frequency oscillator wherein frequency is controlled accurately to 1 part in 12 million. The oscillator signal is shaped into square-wave pulses, which are counted down to a repetition rate of 10 per second. The resultant pulses are used to initiate the sampling of the three quantizers.

Once a reading has been made and stored (in a counter), an electronic sequencer controls the sequential readout of the time number and the three associated shaft position numbers. The data pulses are recorded sequentially, still in binary-coded decimal form, on one track of a magnetic tape. On a second track of the tape, synchronizing pulses are recorded simultaneously in order to provide an unambiguous means for subsequently reading the information from the tape.

The equipment associated with this machine includes encoding matrices and storage devices that produce outputs in a desired code and actuate the output equipment. In this particular case, the playback equipment controls an IBM Type 523 summary punch which reproduces the data on the magnetic tape in punched-card form.

Many of the functions performed in this Datatrol are similar to those performed in a digital computer. Nevertheless, no general-purpose digital computer at present available could be employed economically on this problem; there are functions required here that are ordinarily not required in such a computer.

There are many other applications for data processing that will fall into this category—for example, production planning and scheduling, which often presents unique problems in each plant.

There is a promising future for special-purpose equipment developed out of standardized building blocks. Systems can be assembled to suit the needs of each application. General-purpose equipment might be integrated with special-purpose equipment to provide the unique solution demanded by each situation.

How Can Industry Use Computers?

When a company plans to build a new manufacturing plant, it usually hires a firm of engineers to study the problem and to express the requirements in terms of steel, bricks and mortar, land area and, finally, cost. The company then will engage a firm to build the plant. Even when a company requires something as simple as a hole in the ground for a new oil tank, it hires an expert to dig the hole. Just what is it about the computer industry that prompts so many manufacturers to suppose that they can meet their computing needs as competently as a firm of engineers who have devoted a considerable number of years to the design and application of computers?

The average company that has applications for computers will obtain better results faster and more economically if it retains a firm experienced in this art than if it attempts the job within its own organization, or through a firm of general consultants that do not specialize in this field. The examples given show how the individual needs of various industrial firms have been met by special-purpose computers whose design and application have followed this recommended pattern.

Process Control Analysis

For many types of controlled systems the defining equations are ordinary, linear, and of low order—and have constant coefficients. Conventional analytic solutions of these equations are presented, with practical examples.

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VI. ANALYTIC SOLUTIONS

WE have established the defining equations for various types of controlled processes. Now we shall investigate the equations and their solutions.

The general methods for determining the transient solutions of linear differential equations with constant coefficients are well known. Also, much information regarding a system can be obtained frequently simply by setting up the equation with its appropriate initial conditions.

To study the response of any type of system, it is convient to choose some forcing function and use it as a standard means of comparison. For this study, a *step-function* change $(x_q - x_{qo})$ in outlet potential (x_q) will be assumed. Initial stabilization at the set point also will be assumed—that is, the system is in equilibrium at some preset value. The complete solution will be shown in symbolic form for a sufficient number of cases to demonstrate the procedures. Also, two illustrative, practical examples will be worked out in detail.

Single-capacity Process with Ideal Controller

A single-capacity process with ideal (lagless) controller, measuring element, and valve is shown in Fig. 4-1. The controller is assumed to have proportional and derivative response. The equation for this controlled system, as determined from equation 3.1 of chapter III, is:

$$(H + R_q\beta)(dx/dt) + (1 + R_q\alpha)(x - x_o) = x_q - x_{qo} \qquad 4.1$$

where H is the constant R_qC, β is the over-all derivative control factor, α is the over-all proportional control factor, x is the controlled level, x_q is the pressure to which the flow is discharged, x_o is the desired level, and x_{qo} is the original outlet pressure before the disturbance. The term $(x_q - x_{qo})$ represents the step change in x_q, or the unit disturbance.

Throughout this chapter, the expressions $(1+R_q\alpha)$ and $(H+R_q\beta)$ will appear frequently. For simplicity, we can express the former by constant M_1 and the latter by M_2. Equation 4.1 then becomes:

$$M_2dx/dt + M_1(x - x_o) = x_q - x_{qo}$$

Equation 4.1 is an ordinary, linear differential equation with constant coefficients. It is *ordinary* because the system involves only one independent variable, "t"; it is *linear* because the dependent variable "x" and all of its derivatives appear to the first power only; and it has *constant coefficients* because the system parameters are made up of resistances and capacities which have been assumed as constants. The solution of such equations is conventional and is available in all texts on differential equations. The complete solution of equation 4.1 is:

$$x - x_o = [(1/M_1)(x_q - x_{qo})][1 - e^{-(M_1/M_2)t}] \qquad 4.2$$

The first term in this solution, or $(1/M_1)(x_q - x_{qo})$, represents the steady-state solution, or particular integral. The second term, or $(1/M_1)(x_q - x_{qo})(e^{-M_1t/M_2})$, is the transient solution, or complementary function.

Equation 4.2 can be plotted to yield the system response curve. It is an exponential curve. There never can be oscillation or "hunting" in the response curve of solution 4.2 because there are no imaginary parts in the exponent of the transient solution.

With Integral Control

If we add integral response to the single-capacity ideally controlled system just covered, the defining equation for the controlled process is:

$$M_2\,dx/dt + M_1(x - x_o) + R_q\gamma \int_0^t (x - x_o)\,dt = x_q - x_{qo} \qquad 4.3$$

The initial condition necessary is that at time t equal to zero:

$$x - x_o = 0 \qquad 4.3a$$

The end condition necessary, assuming stabilization is finally achieved, is:

$$\int_0^\infty (x - x_o)\,dt = (x_q - x_{qo})/R_q\gamma \qquad 4.3b$$

This end condition merely states that after sufficient time the integral action will produce an effect equal to that of the disturbance and return the level to the control point.

Differentiating equation 4.3:

$$M_2\,d^2x/dt^2 + M_1dx/dt + R_q\gamma(x - x_o)\;dt = 0 \qquad 4.4$$

The conventional procedure for solving this linear differential equation with constant coefficients is to let $x = e^{pt}$. The auxiliary equation thus produced is:

$$p^2 + (M_1/M_2)p + R_q\gamma/M_2 = 0 \qquad 4.5$$

The roots of this equation, as found from the quadratic formulae, are:

$$p = -M_1/2M_2 \pm \sqrt{M_1^2/4M_2^2 - R_q\gamma/M_2} \qquad 4.6$$

An oscillatory response occurs if the term under the radical is negative—that is, if:

$$R_q\gamma/M_2 > (M_1/2M_2)^2 \qquad 4.6a$$

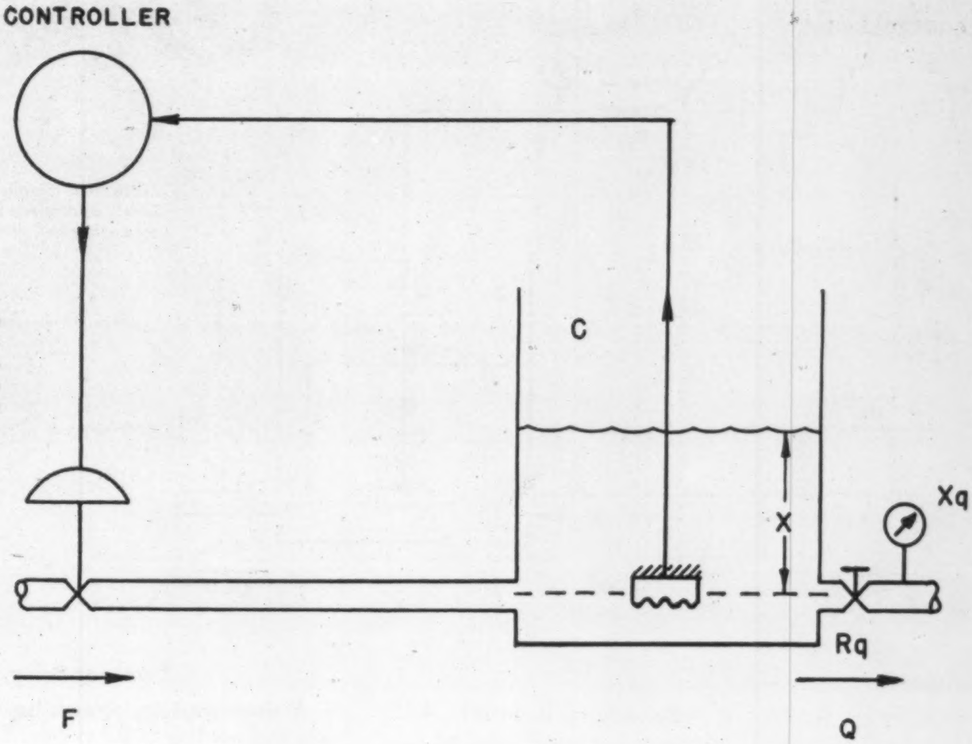

Fig. 4-1. Single-capacity process with "ideal" controller, valve, and measuring system (ideal in the sense that there are no time lags).

For simplicity, equation 4.6 can be expressed:

$$p = a \pm ib \qquad 4.7$$

where $i = \sqrt{-1}$, $a = -M_1/2M_2$, and $b = \sqrt{R_q\gamma/M_2 - M_1^2/4M_2^2}$

The solution of equation 4.4 is:

$$x - x_o = e^{-at}\,(B_1 \cos bt + B_2 \sin bt) \qquad 4.8$$

The constants, as found from the initial and final conditions as given in 4.3a and 4.3b, are:

$$B_1 = 0$$

$$B_2 = \left(\frac{x_q - x_{qo}}{R_q\gamma}\right)\left(\frac{a^2 + b^2}{b}\right)$$

Hence equation 4.8 (the final solution) is:

$$x - x_o = \left(\frac{x_q - x_{qo}}{R_q\gamma}\right)\left(\frac{a^2 + b^2}{b}\right) e^{-at} \sin bt \qquad 4.9$$

This is a familiar equation for a damped oscillatory motion, the damping being less than critical, which was assumed in equation 4.6a. (For an explanation of "damping" and related terms arising in connection with equations of this type, the reader is referred to any text on elementary mechanical vibrations, such as *Elements of Mechanical Vibration* by Freberg and Kemler.)

Note that the solutions of control problems are mathematically the same as the solutions of well-known vibration problems. However, the study of control systems is more inclusive than that of mechanical vibrations. In control systems we encounter differential equations of odd orders (for example, equation 4.1 is a first-order equation); the equations found in vibration analyses are always of even order, regardless of the number of degrees of freedom.

Effect of Lag in Measuring Element and Valve

The same procedure can be used to solve the equations for more complicated situations. The procedure is (1) obtain the appropriate differential equation, which is a linear differential equation with constant coefficients, from the general equations developed, (2) express the solution as the sum of the steady-state and transient solutions, with arbitrary constants equal in number to the degree of the equation, and (3) find the constants from the initial conditions of the system. There must be as many initial conditions as there are arbitrary constants.

Let us apply this procedure to a single-capacity process with ideal controller containing proportional plus derivative action, and with lag in both the measuring element and valve, as in Fig. 4-2. The equation for this, as found from the general equation 3.1, is:

$$T_mT_vHd^3x/dt^3 + (T_mT_v + T_mH + T_vH)d^2x/dt^2$$
$$+ (T_m + T_v + M_2)dx/dt + M_1(x - x_o) = x_q - x_{qo} \qquad 4.10$$

where $T_m = R_mC_m$; $T_v = R_vC_v$; $H = R_qC$; $M_1 = 1 + R_q\alpha$; $M_2 = H + R_q\beta$; $x_q - x_{qo}$ = unit disturbance; $x - x_o$ = deviation from desired initial level x_o.

This third-order equation will have a solution with three arbitrary constants—B_1, B_2, and B_3. To find these constants it is necessary to have three initial conditions. These are that for a unit step change in x_q, and at $t = 0$, (1) the level is at the control point, (2) rate of change of level depends directly on disturbance magnitude and inversely as the "time constant" or RC value, and (3) second derivative of the level depends directly on first derivative and inversely as the "time constant," all preceded by a minus sign; or:

$(d^2x/dt^2)_{t=o} = -(1/H)(dx/dt)_{t=o}$.

These three *initial conditions*, expressed mathematically, are:

$$x - x_o = 0 \qquad 4.10a$$

$$dx/dt = (x_q - x_{qo})/H \qquad 4.10b$$

$$d^2x/dt^2 = -(x_q - x_{qo})/H^2 \qquad 4.10c$$

The steady-state solution of equation 4.10 is:

$$x - x_o = (x_q - x_{qo})/M_1 \qquad 4.11$$

If we suppose that the transient solution is stable and underdamped, as is usually the form desired in automatic control work, then the transient solution can be

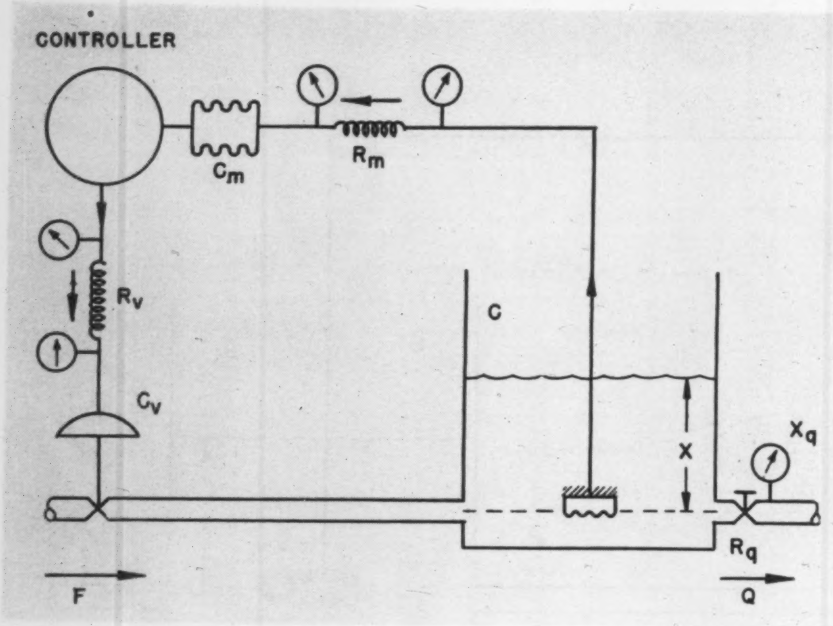

Fig. 4-2. Single-capacity process with ideal controller, but with lag in both measuring and valve circuits.

written as:

$$x-x_o = B_1e^{-a_1t} + e^{-a_2t}(B_2\cos bt + B_3\sin bt) \qquad 4.12$$

where a_1, a_2 and b are positive real numbers to be determined from the auxiliary equation; and B_1, B_2 and B_3 are constants to be determined from the initial conditions. The complete solution is:

$$x-x_o = B_1e^{-a_1t}$$
$$+ e^{-a_2t}(B_2 \cos bt + B_3 \sin bt) + (x_q-x_{qo})/M_1 \qquad 4.13$$

From the first initial condition (4.10a):

$$B_1 + B_2 + (x_q-x_{qo})/K_1 = 0 \qquad 4.14$$

from the second condition (4.10b):

$$-B_1a_1 + B_2b-B_2a_2 = (x_q-x_{qo})/H \qquad 4.15$$

and from the third (4.10c):

$$B_1a_1{}^2-B_2b^2-2B_3a_2b + B_2a_2{}^2 = -(x_q-x_{qo})/H^2 \qquad 4.16$$

These three equations may be solved simultaneously to yield the values of the arbitrary constants B_1, B_2 and B_3.

If a large number of solutions are desired from any given form of equation, the general method presented above would be useful. However, for a single solution, the physical numbers of the various process and controller constants should be substituted immediately into the system differential equations to save time in analysis.

With Integral Control

The combined process and control equation for Fig. 4-2 where integral control is included would be the same as equation 4.10 except that the left-hand side of the equation would have one more term to include the integral control action. This term is:

$$R_q\gamma\int_0^t(x-x_o)\,dt$$

As this effectively raises the order of the equation by one, the solution will have four arbitrary constants. Hence four conditions are needed to obtain these constants. Three of these will be the same initial conditions as expressed in equations 4.10a, b, and c. The fourth is the end condition (for a stable system):

$$\int_0^\infty(x-x_o)\,dt = (x_q-x_{qo})/R_q\gamma \qquad 4.17$$

Two-capacity Process

A single-capacity process has been analyzed, both with and without lags in the system. The same procedure would apply to processes with additional capacity. For example, the general equation for a 2-capacity process was worked out in equation 3.2 in chapter III. From this equation, the equation for a 2-capacity process with a 3-mode controller (proportional plus derivative plus integral), and with no lags in the controller, measuring element and valve is:

$$J_2d^2x/dt^2 + M_4dx/dt + M_3(x-x_o)$$
$$+ R_q\gamma\int_0^t(x-x_o)\,dt = x_q-x_{qo} \qquad 4.18$$

where (Fig. 4-3): $J_2 = C_1C_2RR_q$; $M_4 = J_1 + R_q\beta$; $M_3 = 1 + R_q\alpha$; x = controlled level, or x_2; $J_1 = C_1C_2RR_q$; $x-x_o$ = deviation from control point, or desired level; x_q-x_{qo} = step disturbance.

This 2nd-order integro-differential equation is effectively a 3rd-order differential equation and requires three initial and end conditions. These are:

Initial conditions at $t = 0$:

$$x-x_o = 0 \qquad 4.18a$$

$$dx/dt = (x_q-x_{qo})/R_qC_2 \qquad 4.18b$$

End condition:

$$\int_0^\infty(x-x_o)\,dt = (x_q-x_{qo})/R_q\gamma \qquad 4.18c$$

Three-capacity Process

The equation for a 3-capacity controlled process would be the same as 4.18 except that the left-hand side would contain the added term J_3d^3x/dt^3, where $J_3 = C_1C_2C_3R_2R_3R_q$, and the values of J_1 and J_2 would be as developed for equations 1.18 in chapter I.

The added initial condition required, would be that, at $t = 0$:

$$d^2x/dt^2 = -(x_q-x_{qo})(R_3 + R_q)/R_q{}^2C_3{}^2R_3 \qquad 4.18d$$

As shown, all the solutions were arrived at in similar manner. Although certain characteristics of system behavior can be determined from the roots of the auxiliary equation (as in equation 4.5), a complete picture of the

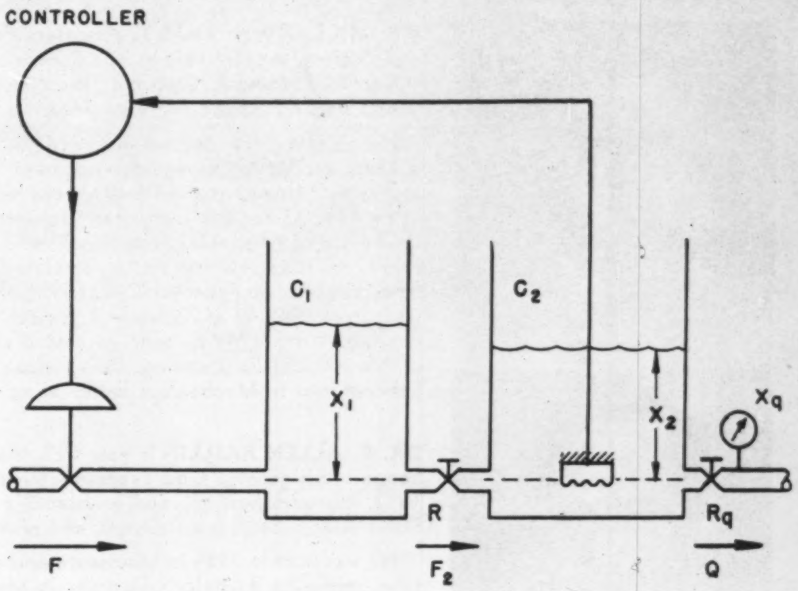

Fig. 4-3. Two-capacity process with ideal controller, valve, and measuring system.

solution requires knowledge of the initial and end conditions.

The next step is to solve numerical examples of typical investigations.

Example 1

A process consists of two tanks of liquid (Fig. 4-3). The controlled variable is the level in the second tank, which we will call x. This is controlled by means of a proportional-plus-rate controller, with negligible lag. We will assume that the measuring element and the final control are ideal. The values of the process and controller constants are: $C_1 = 1$ ft³/ft; $C_2 = 2$ ft³/ft; $R_2 = \frac{1}{2}$ ft/cfm; $R_q = 2$ ft/cfm; $\alpha = 30$; $\beta = 1$.

Assuming a step change in x_q of +20 ft to cause a decrease in outflow, Q, evaluate the equation of the response curve.

Solution:

The equation for this process is:

$$J_2 d^2x/dt^2 + (J_1 + R_q\beta)\,dx/dt + (1 + R_q\alpha)(x - x_o) = x_q - x_{qo} \qquad 4.19$$

where $J_1 = C_1R_2 + C_1R_q + C_2R_q = 6.5$

$J_2 = C_1C_2R_2R_q = 2$

Substituting the numerical values and choosing our datum such that $x_o = 0$ gives:

$$d^2x/dt^2 + 4.25dx/dt + 30.5x = 10 \qquad 4.20$$

The initial conditions at $t = 0$ are:

$$x - x_o = 0 \qquad 4.20a$$

$$dx/dt = (x_q - x_{qo})/R_qC_2 = 5 \qquad 4.20b$$

Steady-state Solution

The complete solution is the sum of the steady-state and the transient solutions. The steady-state solution is:

$$x = 10/30.5 = 0.328 \qquad 4.21$$

This means that after the load change the liquid level will eventually settle at a value of 0.328 feet above the original set point. Where there is no integral control action, offset of this type always occurs following a load change.

Transient Solution

The transient solution may be found by making the substitution:

$$x - x_o = e^{pt}$$

and its derivatives into Eq. 4.20. This yields:

$$p^2 + 4.25p + 30.5 = 0 \qquad 4.22$$

which has roots:

$$p = -2.125 \pm 5.1\,i$$

The complete solution (the sum of the transient and steady-state solutions) has the form:

$$x - x_o = e^{-at}(B_1 \cos bt + B_2 \sin bt) + 0.328 \qquad 4.23$$

where $a = 2.125$; $b = 5.1$; and B_1 and B_2 are constants to be determined from the initial conditions.

Substituting the first initial condition (Eq. 4.20a) into Eq. 4.23:

$$0 = 1(B_1 + 0) + 0.328$$

$$B_1 = -0.328 \qquad 4.24$$

Differentiating the complete solution (Eq. 4.23) we obtain:

$$dx/dt = -ae^{-at}(B_1 \cos bt + B_2 \sin bt) + e^{-at}(-B_1b \sin bt + B_2b \cos bt)$$

Using the second initial condition (Eq. 4.20b) yields:

$$5 = -a(B_1 + 0) + 1(0 + B_2b)$$

$$5 = -(2.125)(-0.328) + 5.1\,B_2$$

$$B_2 = 0.843 \qquad 4.25$$

Thus, the final solution is:

$$x - x_o = e^{-2.125t}(-0.328 \cos 5.1t + 0.843 \sin 5.1t) + 0.328 \qquad 4.26$$

from which $(x - x_o)$ may be plotted against time t to give a complete picture of the response curve.

Example 2

The temperature of an industrial oven is held constant by means of an automatically controlled by-pass damper in a hot-air supply. If the controller is ideal and has all three control responses, determine the response equation due to a step rise in outlet temperature of 0.5°F. Assume a measuring element lag is present. The capacity and other parameters are:

$C = 10$ BTU/°F.

$T_m = 1$ min = time lag in measuring element

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He received the degree of B.S.M.E. from the University of Minnesota in 1936, and served as research engineer with Johns-Manville from 1936-37 and with Minnesota and Ontario Paper Company from 1937-41. From 1941-43 he was Instructor, Department of Mechanical Engineering, University of Minnesota, receiving the degree of M.S.M.E. from the University in 1943. He has been associated with the University since 1943; from 1943-46 as Assistant Director of the Engineering Experimental Station; from 1946-49 as Assistant Professor, Department of Mechanical Engineering; from 1949-present as Associate Professor of the Department of Mechanical Engineering, being also in charge of the Instrumentation Laboratories in Mechanical Engineering.

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$R_q = 0.5°F\ min/BTU$

$a = 11$

$\beta = 8$

$\gamma = 3$

The system equation is:

$$T_mH\ d^2x/dt^2 + (T_m + H + R_q\beta)\,dx/dt + (1 + R_qa)(x - x_o) + R_q\gamma\int_0^t (x - x_o)\,dt = x_q - x_{qo} \qquad 4.27$$

where $H = R_qC = 5$ min.

Substituting the numerical values of the constants:

$$d^2x/dt^2 + 2dx/dt + 1.3(x - x_o) + 0.3\int_0^t (x - x_o)\,dt = 0.1 \qquad 4.28$$

Differentiating this removes the integral sign:

$$d^3x/dt^3 + 2d^2x/dt^2 + 1.3\ dx/dt + 0.3(x - x_o) = 0 \qquad 4.29$$

The initial conditions at $t = 0$:

$$x - x_o = 0 \qquad 4.29a$$

$$dx/dt = (x_q - x_{qo})/R_qC = (0.5)/(0.5)(10) = 0.1 \qquad 4.29b$$

End condition:

$$\int_0^\infty (x - x_o)\,dt = (x_q - x_{qo})/R_q\gamma = (0.5)/(0.5)(3) = 0.33 \qquad 4.29c$$

This time, the steady-state solution is zero if we choose our datum such that $x_o = 0$. The transient solution (the complete solution in this case) may be found by the substitution of $(x - x_o) = e^{pt}$. This leads to:

$$p^3 + 2p^2 + 1.3p + 0.3 = 0$$

which has roots:

$$p_1 = -1$$

$$p_{2,3} = -0.5 \pm 0.224\ i$$

Then the complete solution has the form:

$$x - x_o = B_1e^{-a_1t} + e^{-a_2t}(B_2 \cos bt + B_3 \sin bt) \qquad 4.30$$

where $a_1 = 1$; $a_2 = 0.5$; $b = 0.224$.

Substituting the first initial condition (Eq. 4.29a) into Eq. 4.30 yields:

$$0 = B_1 + B_2 \qquad 4.31$$

Differentiating Eq. 4.30 and using the second initial condition (Eq. 4.29b):

$$1/10 = B_1a_1 + a_2B_2 + B_3b$$

$$0.1 = B_1 + 0.5B_2 + 0.224B_3 \qquad 4.32$$

Integrating Eq. 4.30 we obtain:

$$\int_0^\infty (x - x_o)\,dt = B_1\int_0^\infty e^{-a_1t}dt + B_2\int_0^\infty e^{-a_2t} \cos bt\ dt + B_3\int_0^\infty e^{-a_2t} \sin bt\ dt$$

which, upon performing the integration and using the third initial condition, (Eq. 4.29c) leads to:

$$(x_q - x_{qo})/R_q\gamma = B_1/a_1 + B_2a_2/(a_2^2 + b^2) + B_3b/(a_2^2 + b^2)$$

From which:

$$0.333 = -B_1 - 1.67B_2 + 0.748B_3 \qquad 4.33$$

Solving Eqs. 4.31, 4.32, and 4.33 simultaneously for B_1, B_2 and B_3:

$$B_1 = 0.285$$

$$B_2 = -0.285$$

$$B_3 = 0.190$$

The final solution may be written:

$$x - x_o = 0.285\,e^{-t} + e^{-0.5t}(-0.285 \cos 0.224t + 0.190 \sin 0.224t) \qquad 4.34$$

Again $(x - x_o)$ may be plotted as a function of time (t) to give a complete picture of the response curve due to the change in load on the system.

To be continued

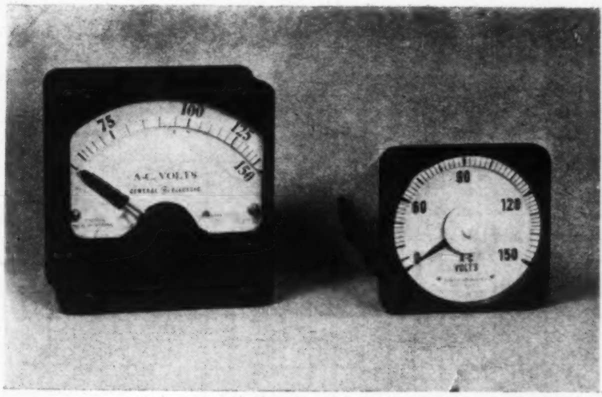


Fig. 1. 90-degree switchboard instrument (left) and long-scale switchboard instrument (right).

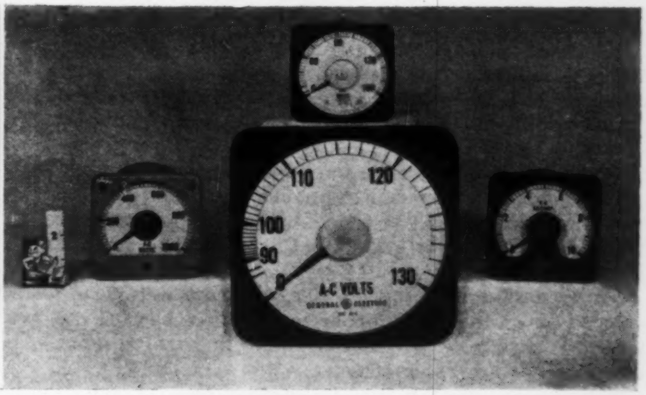


Fig. 2. Long-scale switchboard instruments.

Application Considerations for Long-scale Panel Indicators

Proper application of panel-type electrical indicators involves consideration of scale factors, overload factors, voltage and frequency influence, damping and response time, environmental factors, and lead resistance. ASA Specifications C39.1 defines the limits of these factors.

HAROLD RICH
General Electric Company

INCREASING the scale length of an indicator increases the instrument readability without any decrease in accuracy. To illustrate: For a 90-degree instrument with linear distribution and a 5-inch scale length, a 1-percent accuracy limit is 0.05 inch of scale; for a 250-degree instrument with a 7.1-inch linear scale, the 1-percent limit is 0.071 inch. Thus, the pointer of the latter instrument can vary 0.021 inch more than the former and be just as accurate.

There is a trend in industry toward superseding conventional 90-deg.-scale instruments with longer-scale, 250-degree smaller-sized indicators. This article discusses the major operating characteristics of long-scale indicating instruments, and the important factors affecting their performance.

Overload

An important factor in instruments used to measure motor starting loads is ability to withstand momentary overloads. All long-scale switchboard instruments will stand instantaneous application of ten times the full-scale quantity for one second without mechanical damage. The a-c ammeter will stand many times more overload.

In accordance with Military Specification MIL-M-16034 (issued April 15, 1951) and the American Standard for Electrical Indicating Instruments C39.1 (issued by the American Standards Association and approved January 4, 1951) all current and potential circuits must stand a sustained overload of at least 20 percent without causing electrical breakdown or any observable physical degradation. Generally speaking, current circuits of long-scale a-c ammeters and wattmeters will stand many times more than 20-percent sustained overload (ammeters can withstand about 100-percent overload and wattmeters about 50-percent). d-c ammeters operating with shunts, however, are usually limited by the shunt heating when subjected to sustained overloads.

Voltage and Frequency Influence

To stay within the ASA Specification C39.1 limits, it is recommended that all wattmeters, varmeters, frequency meters, temperature indicators, and power-factor indicators operate within ± 10 percent of the normal voltage, and that all a-c instruments be within ± 10 percent of the normal frequency.

Damping and Response Time

ASA Specification C39.1 sets the following limits on damping and response time:

	Maximum Response Time (seconds)	*Maximum Percent Overshoot*
Ammeter and Wattmeter	2.5	20
Power Factor Meter at 2/3 rated current	2.5	33
Frequency Meter	5.0	67

It is important to remember that damping and response time are not controlled to exact values on standard instruments and, therefore, it is inadvisable to specify a specific damping condition (such as critical damping) when ordering such devices. Since damping is affected by the full-scale adjustment, it will vary with the amount of adjustment required. Therefore, if an application requires other than standard damping or response time, wide limits should be given so as to avoid the higher costs of precise damping adjustments.

Scale Marking

Inasmuch as long-scale instruments do not lend themselves to multiple scale marking, a scale with one set of divisions but two sets of numerals is usually provided where more than one scale is desired. For easy readability the value of each scale division for both scale ranges should be 1, 2, 5, or any decimal multiple or submultiple of these numbers. Under exceptional cases, units of 2.5 and 4 are acceptable. Two sets of calibration lines can be marked by a two-color system, but it is costly and results in poor readability.

Three sets of numerals on one scale are not recommended for ordinary switchboard applications because the numerals have to be so reduced in size that they are not readable at appreciable distances.

Standard instruments usually have between 30 and 80 scale divisions. If more precise readability is desired, up to 150 divisions can be marked on the scale, in which event fine line marking and smaller numerals have to be used. One should not infer, however, that fine marking will improve the accuracy of the instrument. For example, if an instrument with a 7.1-inch linear scale were marked with 150 divisions, the divisions would be 0.047 inch apart. However, as previously pointed out, the accuracy of the 1-percent instrument is ± 0.071 inch of scale.

No more than four digits per scale point are generally used. For example, instead of using a scale marked 50,000 watts, it is preferable to use 50 kilowatts.

Environmental Influences

The effects of environmental conditions on the accuracy of long-scale instruments include:

1. *Vibration and Shock*

Vibration is a continuing periodic motion, usually of low amplitude. Errors due to vibration have been minimized in two ways: (1) By use of special vibration mounts which isolate the instrument from the source of vibration. (2) By use of vibration-resistant pivots which are of wider radius than those normally employed in instrument construction.

Shock, as contrasted to vibration, is a concentrated disturbance of large amplitude. Errors from this source have been minimized in special instruments by shock-resistant bases, plastic windows, reinforced components, and ample cross sections. The principal applications for such instruments (which meet the Armed Services' requirements for a 2000-foot-pound shock test) are on combat vessels. A typical shock-resistant instrument is shown at the left in Fig. 2.

2. *Position Influence*

The angle of inclination of the panel on which instruments are mounted can cause either a change in indication or, in a-c instruments, vibration of the armature. The magnitude of these effects depends on the type of instrument. However, the angle of the panel to the vertical should be specified when ordering instruments for other than standard vertical-face mounting. For a 60-deg. tilt from the vertical, a maximum change of 1-percent of the scale length is permitted by ASA Specifications C39.1.

3. *Temperature Limits*

Long-scale instruments will indicate freely when operated continuously at any ambient temperature from minus 4 to plus 122 F., or from minus 20 to plus 50 C., as stated in ASA Specifications C39.1.

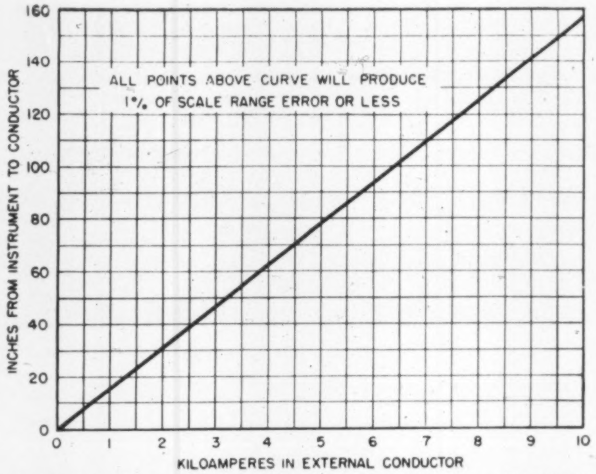


Fig. 3. Maximum influence of external field on type AB and DB long-scale instruments.

4. *Magnetic Panels*

A steel instrument case provides sufficient shielding so that accuracy will not be affected by the panel on which the instrument is mounted.

5. *External-field Influence*

A conductor, carrying current in close proximity to a long-scale instrument, will produce a magnetic field that can cause a change in indication. ASA Specifications C39.1 states that such changes for ammeters, voltmeters, and wattmeters should not exceed 3 percent when the instrument is subjected to a 5-oersted field. This error should not exceed 0.03 for a power-factor meter, and 4 percent for a frequency meter.

To determine whether this error has to be considered in a specific case, refer to Fig. 3. All points below the curve can produce errors in excess of ASA limits. For example, an isolated conductor carrying 5 kiloamperes and located 100 inches from the instrument will give a point above the curve and, consequently, the error will be less than ASA limits. This same conductor carrying the same current but located only 60 inches from the instrument, will give a point below the curve with a resulting possible error in excess of ASA limits. Note that the curve indicates maximum errors; most instruments will have much smaller errors than shown.

6. *Dust and Moisture Proofness*

Long-scale instruments are adequately sealed against dust and moisture for all normal indoor applications.

Lead-resistance Limits

Lead resistance affects calibration of (1) d-c millivoltmeters, (2) a-c voltmeters which are rated 15 volts and below, and (3) temperature meters. Fig. 4 shows the maximum allowable lead resistance for type DB d-c millivoltmeters so that the instrument indication will not change more than 0.1 percent for a 1-deg.-C. change in ambient temperatures.

As the terminal resistance of a-c voltmeters decreases with decrease in rating, a given lead resistance will constitute an increasingly larger part of the total resistance at the lower ratings. Therefore, for ratings of 15 volts and less, it is desirable to specify the lead resistance.

High-potential Limits

All standard instruments will withstand a high-potential test of at least 2600 volts from terminals to case for one minute.

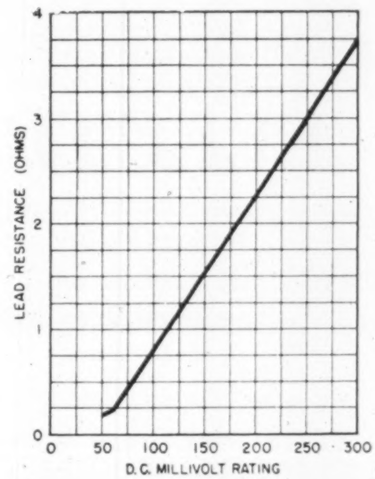


Fig. 4. Maximum allowable lead resistance for a 0.1 percent temperature coefficient of type DB long-scale d-c millivoltmeter.

Special Wattmeter and Varmeter Connections

In recent years there has been a trend toward measuring watts and vars of polyphase circuits by using special connections. This is usually done to save the cost of equipment such as extra transformers. It should be noted, however, that such connections will not measure correctly under conditions of unbalanced voltages and/or unbalanced loads. Standard polyphase power measurements require N–1 elements, where N is the number of wires in the circuit. If less than N–1 elements are used, errors will result under unbalanced conditions. For example, assume that a single-phase wattmeter were used to measure total circuit power by connecting it in one phase of a 4-wire 3-phase circuit with an unbalanced load. Under conditions of extreme unbalance it is possible for the phase in which the instrument is connected to take no load while the other two phases are taking a significant load; the wattmeter would read zero.

Suppressed-zero Instruments

Indicating instruments having the zero suppressed below the marked scale range are not to be recommended. As there is no zero on the scale, an operator is unable to tell from examination of the instrument whether or not the zero is set correctly. Moreover, such an instrument requires more than the usual amount of zero adjustment because the spring is constantly under tension and is deflected over a larger effective angle than a standard instrument.

In addition, suppressed instruments generally have greater ambient temperature errors and slower response times than standard instruments.

Multi-range Instruments

In order to avoid the increased cost of multi-range instruments, it is desirable to use external multipliers, current and potential transformers, and shunts. In addition to higher cost, increased internal heating with larger temperature errors, different scale distributions, and switching difficulties also can result from multi-rating an instrument.

Recommended Ranges

It is customary for instrument manufacturers to specify certain minimum ratings of scale ranges. Beyond these limits, errors evidenced by jewel roll or stickiness may be caused by bearing friction or similar factors. The *minimum ratings* shown below are representative of long-scale instruments of rugged, reliable designs. (Although these limits can be extended, such extension is not recommended for best results.):

D-C Ammeter: 300 microamperes

D-C Voltmeter: 40 millivolts

A-C Ammeter: 50 milliamperes

A-C Voltmeter: 5 volts

A-C Wattmeter: 400 watts per element (for a 5-ampere 120-volt instrument).

Varmeter: 200-0-200 watts per element (for a 5-ampere 120-volt instrument).

Frequency Meter: Scale range is 15 percent of mid-scale frequency.

A-C Temperature Meter: 100 deg. C. scale range.

Special comment should be made regarding the minimum rating of wattmeters and varmeters because there has been some misunderstanding on this point. A wattmeter, like any other piece of moving equipment, requires a minimum torque at the shaft of the moving parts for satisfactory operation. For given current and potential transformers, the scale range is a direct measure of the amount of torque available to drive the pointer up scale. There must, therefore, be some minimum scale range that will give the minimum calibrating watts on the instrument. The scale will be a minimum when there are 400 watts per element on a wattmeter and 200 watts per element (zero center) on a varmeter, for 5-ampere 120-volt instruments.

The following three formulae are for minimum wattmeter scales for 5-ampere 120-volt instruments:

Single-phase: Minimum scale = 0.67 x primary current rating x primary potential rating.

3-*wire* 3-*phase*: Minimum scale = 1.33 x primary current rating x primary potential rating.

4-*wire* 3-*phase*: Minimum scale = 2.67 x primary current rating x primary potential rating for the common 2½-element wattmeter.

The corresponding minimum zero-center varmeter scales, each side of center, are:

Single-phase: Minimum scale = 0.33 x primary current rating x primary potential rating.

3-*wire* 3-*phase*: Minimum scale = 0.67 x primary current rating x primary potential rating.

4-*wire* 3-*phase*: Minimum scale = 1.33 x primary current rating x primary potential rating.

If a scale lower than the minimum is required, either the current transformer rating is chosen too high, or the load has a low power-factor. In the former, an instrument rated less than 5 amperes should be used. In the latter, special low-power-factor instruments are available with scales one-half the standard scale.

Recommended Ratings

Most manufacturers can offer quicker delivery with possible savings in cost by supplying instruments of common ratings. Therefore, it is recommended that the following ratings be used wherever possible:

D-C Ammeters (used with external shunt): 50 mV and 100 mV. (self-contained): 1, 2, 3, 5, 8, 10, 20, 25, 30, 50, and 60 amperes.

D-C Volts: 150, 300, 600, and 750 volts.

A-C Amperes (for use with current transformers): 5 amperes.

A-C Voltmeters (for use with potential transformers): 150 volts.

A-C Wattmeters and Varmeters (for use with transformers): 5 amperes, 120 volts.

Power Factor Meters: 5 amperes, 120 volts.

Frequency Meters: 120 volts.

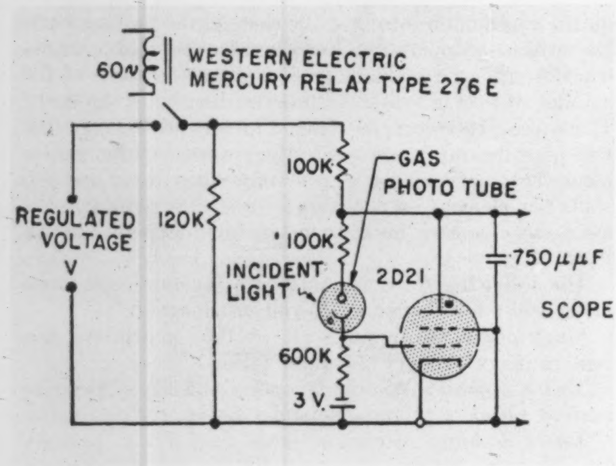
Synchroscopes: 120 volts.

HIGH-SENSITIVITY PHOTOTUBE CIRCUIT

Sensitivity of gas-filled phototubes can be increased by increasing the anode voltage—but a sensitivity gain of only 10 can be realized because higher voltage may produce a sustained discharge and damage the photosurface. This circuit provides an increase in sensitivity of standard gas phototubes of 10^7, and has an output that is readily converted to digital form.

Increase in sensitivity is obtained by using a higher than normal anode voltage; phototube is protected by a 2D21 thyratron which fires and lowers the applied voltage to a safe value before anode current becomes excessive. Time for thyratron to fire is linear function of incident light over six decades of light intensity.

Relay is operated at 60 cycles (16.6 millisecond intervals), and is "on" for 8 milliseconds and "off" for 8 milliseconds. When "on" it applies voltage V (greater than breakdown potential of phototube used) to phototube and 2D21 thyratron. Thyratron is held cutoff by 3-v bias. Incident light causes phototube current, which increases by ionization-multiplication. When this current reaches 1 microampere, it develops sufficient voltage across 600K resistor to fire the 2D21 thyratron, at which time voltage across phototube is reduced to 10 volts, terminating the phototube current buildup. Time for current to reach the 1-microampere value (and fire the thyratron) is linear function of incident light, and can be monitored on an oscilloscope, converted to a voltage, or measured with a counter chronograph (which would give digitized output).



Regulated voltage supply is necessary because buildup time depends on supply voltage. The 750-uuf capacitor is used to round off leading edge of voltage applied when relay closes, which might trigger thyratron.

Output: Rectangular 60-cycle pulses of amplitude V, whose duration (up to 8 milliseconds) depends on incident light.

Typical duration: 0.7 millisecond (700 usec) for incident light of 5×10^{-8} lumen with 260-v supply and Type 5583 gas phototube (S4 surface).

Effect of supply voltage with 5583 tube and 5×10^{-8} lumen: pulse duration is 400 usec at 270-v supply; 550 usec at 265-v supply; 700 usec at 260-v; 1100 usec at 255-v supply.

Linear range: 10^{-3} to 10^{-9} lumen incident light with 5583 tube and 260 to 270 v supply.

Frequency response is limited by 60-cycle relay pulsing interval. Hence use is in low-level applications where high frequency-response is not needed.

Source: E. O. Johnson, RCA Laboratories Div., Princeton, N. J.; *Review of Scientific Instruments*, Aug., 1954.

ELECTRONIC

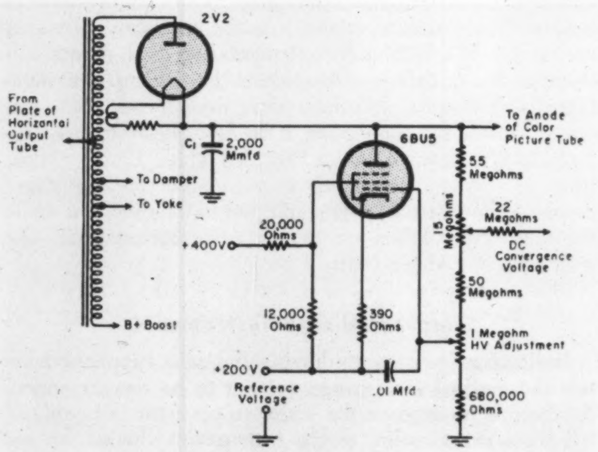
CHARLES F. KEZER
Potter Instrument Co.

and

MILTON H. ARONSON
Instruments Publishing Co.

20,000-VOLT SHUNT REGULATOR

Intended for TV, this high-voltage regulator circuit should find other applications. Type 6BU5, a low-current, high-voltage beam pentode, was designed primarily for use as a shunt voltage regulator. Maximum plate voltage is 20,000 v; maximum plate dissipation is rated at 20 watts. Cathode and screen voltages of the 6BU5 are derived from low-voltage reference supplies which must be relatively constant because the high-voltage output will tend to follow them.



Grid voltage of regulator tube is adjusted for 1.0-ma plate current with zero high-voltage load current. When current is drawn, high voltage drops, the grid voltage of the 6BU5 tube drops correspondingly, and the plate current decreases, compensating for the increased load current. The regulator holds high-voltage change to about 2 percent for load current change from zero to 1.0 ma.

A supply for 6BU5: 6.3 v at 150 ma.

Source: G. C. Church, Receiving Tube Sub-Dept., GE, in *Service*, December 1954.

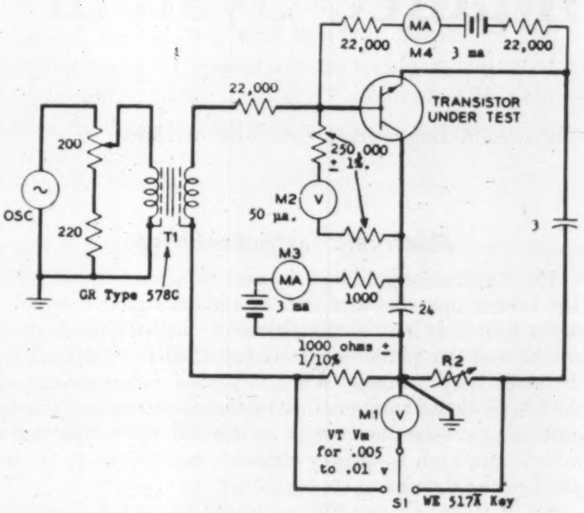
TRANSISTOR TEST SET

This circuit measures current amplification factor (alpha) of a transistor without dependence on VTVM calibration because VTVM reads same input and output voltages. The alpha of junction-type transistors is usually between 0.9 and unity.

Collector voltage is measured by M2 (resistors in series with M2 comprise d-c voltmeter). Collector current is

CIRCUITRY

The circuit is the heart of all electronics. Here are four more basic and interesting circuits. Unless marked, resistors are in ohms, capacitors in microfarads.



measured by M3. Emitter current is measured by M4.

To measure alpha, the a-c VTVM (M1) is first connected across 1K resistor on input side of transistor. Level of signal is adjusted with 200-ohm pot to a value that does not overload transistor. M1 is then switched across R2, and R2 is adjusted to obtain same VTVM reading. Value of alpha is then:

$$R2/R1 = 1 - \text{alpha}$$

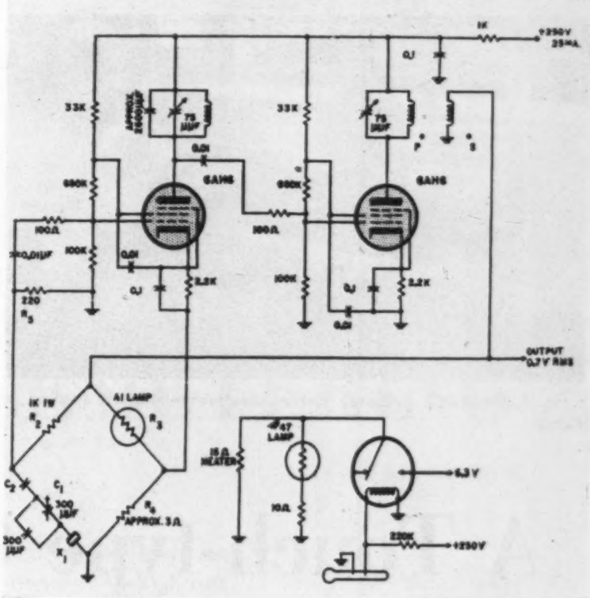
Resistor R2 comprises 3 resistance decades with steps of 0.1, 1.0, and 10 ohms, plus a switch mounting three 100-ohm noninductive resistors. Circuit can be used without error to frequencies as low as 200 cps; upper limit of frequency depends on stray capacitance; readings to 100 kc are obtained.

Source: F. R. Stansel, Transactions of IRE-PGI, April, 1954.

1-Mc FREQUENCY STANDARD

This portable 1-Mc frequency standard, developed by the National Bureau of Standards, features stability of a few parts in 100 million per day—nearly that of the crystal itself. It is sufficiently rugged for field use.

Any phase shift in the amplifier is compensated by an opposite shift in the bridge circuit. *A Meacham bridge circuit* is used. The output signal (from the output transformer) is fed to the bridge. The portion of this signal fed to the grid (through R_2) is *degenerative;* that fed to the cathode of the first stage (through the variable-resistance



lamp is *regenerative.* When the oscillation amplitude increases, lamp resistance increases, decreasing amount of regenerative feedback; this stabilizes output level. Crystal is operated at its series-resonant frequency; thus minimum degeneration (and maximum gain) occur at that frequency.

The A1 switchboard lamp requires at least 0.7 v for proper operation. The two-stage amplifier has a voltage gain of about 1000. The AT-cut crystal is kept in a temperature-controlled oven.

Source: National Bureau of Standards, Washington 20, D. C.

Where Control Fails

Each of you has received a personal correction notice through the mails, asking you to interchange the position of the first two circuits on page 973 of the June issue of *I&A* (the Miniature Oscilloscope and the Variable-Reluctance-Pickup Preamp). A note of explanation is in order.

We have an elaborate checking system to assure accuracy in copy matter and illustrations. However, when the presses are running, they are occasionally stopped to clean the cuts so that nice impressions result. In this instance, the two cuts were replaced in wrong order—and the proofman at the printing plant did not catch the error. Control of human malfunction is still the unexplored frontier of automation.

We Are Pleased To Acknowledge

To the Editor:

In the "Electronic Circuitry" department of the June issue of *Instruments and Automation*, you show an a-c VTVM circuit credited to Trio Laboratories, of Wantagh, New York.

Admittedly, the exact origin of a particular circuit is of secondary importance in this field of engineering. Nor can anyone keep up with all the literature.

I can't help noticing, however, that this circuit is an exact copy of that in the Heathkit AV-2 voltmeter, including the values of the interstage and screen bypass capacitors, which were found to be critical in order to get maximal flatness in the low-frequency cutoff region. The AV-2, in turn, is taken from a circuit published in *Electronics*, September 1950, page 152, and in *Radio and Television News*, February 1951, page 56. These, in turn, were derived from a development by H. L. Daniels at the Naval Ordnance Laboratory in 1943 or 1944, to whom credit was given.

Lawrence Fleming

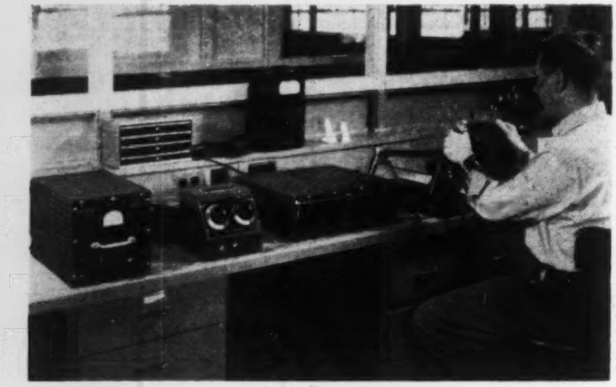


Fig. 1. Electronic guidance system uses tactual signals applied to thumb.

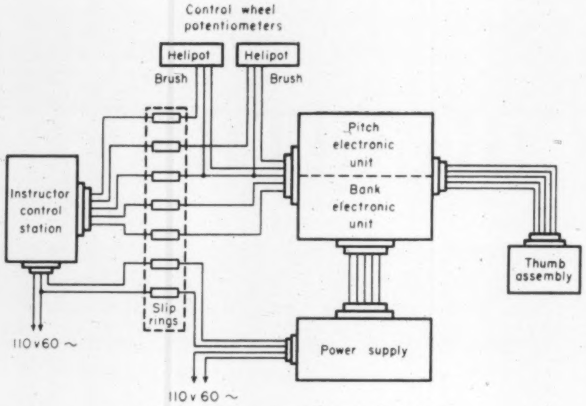


Fig. 2. Tactual system for a Link Trainer.

A Touch-type Guidance System

R. W. HESSINGER and **J. W. BALLARD,** The Commonwealth Engineering Company of Ohio

In this age of instrumentation and servomechanisms, machines are becoming so complicated that it taxes all the abilities of the human being to operate them. At present, the visual and aural senses of an aircraft pilot are employed to near full capacity. An alternate system was sought using a different sense.

Tactual (touch-type) signals applied to the human body and to the head were investigated. These investigations suggested that application of a tactual signal to the pilot's thumb might yield satisfactory results.

Psychological Aspects

Three types of signals were considered for the thumb actuator—(1) a continuously variable pressure, (2) a continuously variable frequency, and (3) a group of discrete-frequency steps.

The first proved inadequate because of subject adaptation to static or slowly changing pressures. The variable-frequency signal was more acceptable since it did not allow the thumb to become acclimated. However, small frequency changes were difficult to distinguish. Successive steps in frequency could be more easily distinguished than a continuously variable frequency signal. The tactual signal adopted was one of three discrete frequency bands: First band 5 to 25 pps (pulses per second); second band 20 to 55 pps; and third band 50 to 100 pps.

The signals must be so situated that the points of contact cannot be misinterpreted. The following points of application were used: (1) Top of thumb immediately behind the thumb nail. (2) Bottom of thumb just forward of the first joint. (3) On the inside surface of the thumb between the first and second joints. (4) On the outside surface of the thumb between the first and second joints.

Points one and two provide pitch control; points three and four provide bank control. This placement of signals also provides for the correlation of signal direction with aircraft attitude such that motion away from the thumb actuator signal produces similar aircraft motion.

Electronic Instrumentation

The electronic guidance system is shown in Fig. 1. The system operates such that no tactual signal is applied to the thumb as long as the difference between the desired course and the actual course is less than the limit set by the sensitivity controls. When a course difference exists, the lowest signal frequency is applied to the proper thumb unit. A successive increase in course difference causes the middle and high frequency signals, respectively, to be applied to the thumb.

Fig. 2 shows an assembly arranged for installation in a Link trainer. The instructor control station, operated in a position remote from the trainer, is connected electrically to the remainder of the System through a slip-ring arrangement.

Thumb Assembly Unit

The thumb assembly unit consists of four actuators, each of which supplies one of the four necessary thumb signals, a housing unit which holds the actuators to the thumb, and a junction box.

A small size thumb actuator, or electromechanical transducer, was developed by using a high permeability material. The section of the shaft of the thumb actuator contacting the thumb was flat-ended. While not producing pain, the blunt end gave sharp, distinct signals to the thumb.

Conclusions

The Tactual Sensory Guidance System provides a research tool for the psychologist in his initial study of aircraft attitude control through tactual signals applied to the thumb. Although designed for use with the Link trainer and subsequent use in aircraft, a similar system may be employed for other types of vehicular guidance in three dimensional fluids such as air or water; also for excavation machinery, tanks in battle, high-speed vehicles, etc. Tactual signals might also be applied to the thumb of the blind for guidance.

Abstracts from a paper delivered at the 1954 Conference on Airborne Electronics.

Journal of the S C M A . . .

SOUTHERN CALIFORNIA METER ASSOCIATION

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PIPELINE TELEMETERING

The impulse-type Metameter telemetering system is described in detail, including transmitter and receiver functions and remote-control techniques. Descriptions of recent telemetering systems of the Mississippi Valley Gas Company and the Southern California Gas Company illustrate the new features, including digitized readout, automatic scanning, and tone channels.

J. W. PECKHAM

The Bristol Company

TELEMETERING makes possible the most efficient use of transmission and distribution facilities under widely varying demands. The rapid extension of natural-gas and petroleum-product pipeline systems has resulted in an equally rapid development of new telemetering systems. This article reports a few recent installations of general interest, and reviews a few fundamentals of telemetering.

Types of Telemetering Systems

Telemetering is defined as the art of measuring at a distance. The American Institute of Electrical Engineers classifies point-to-point telemetering, according to the means of transmission, under five groups as follows:

1. Current	(ammeter)
2. Voltage	(voltmeter)
3. Frequency	(frequency meter)
4. Position	(bridge circuit—inductive, resistive, etc.)
5. Impulse	

The impulse-type telemetering system transmits the measured value as a function of time (a pulse of variable duration), and is the only system independent of electrical magnitudes. For example, a change in line resistance, which might cause errors in other systems, has no effect on the accuracy of the impulse type.

Another important feature of the impulse type is its inherent self-synchronizing characteristic. After any interruption of power at either end, or in the event of line failure, it is necessary only to restore facilities and the system will immediately return to normal operation without any supervision or readjustment. This action is of utmost importance in the operation of a system involving long distances and unattended stations (as usually found in pipeline operation). As the impulse type has proved satisfactory in thousands of installations during the past 20 years, we will limit our discussion to the impulse type.

The principal parts of a telemetering system are: (1) transmitter, (2) receiver, and (3) interconnection means.

Transmitter

The telemeter transmitter (Fig. 1) measures the variable (static pressure, differential pressure, temperature, liquid level, specific gravity, etc.) and converts this reading into an electrical impulse whose length depends on the measured variable. Standard maximum impulse duration is 5 or 15 seconds.

In the Bristol Metameter with 5-second cycle duration the length of the pulse actually used for transmitting the signal is from 1 to 4 seconds (if telemetering a pressure of 0-100 psi the impulse will be 1 second at 0 psi, 2.5 seconds at 50 psi, and 4 seconds at 100 psi). In a 15-second impulse-cycle system the active length of the signal is from 3 to 12 seconds.

Fig. 1 shows a Metameter transmitter for static pressure. Motion of the measuring element (11) positions the cam follower (3). As the cam rotates (driven by a constant-speed motor), the tip of the cam follower slides across the cam surface (not along the edge of the cam) and drops off the trailing edge. It is again picked up by the cam's leading edge. The rise and fall of the cam follower causes the trip plate (21) to move in and out, opening and closing mercury switch (13). If the cam follower is located so that it describes a path shown by B_1—A_1, a 1-second impulse will be transmitted. If the cam-follower position is such as to describe path B_2—A_2, a 4-second impulse will be transmitted.

Receiver

The telemeter receiver converts the electrical impulse into a mechanical motion to position a pen or pointer.

August Meeting: *Thursday, the 18th, Rio Hondo Country Club, Downey, Calif.*

Feature: *G. O. Kimmell, Kimray, Inc., will present a talk on "Floatless Liquid Level Controllers."*

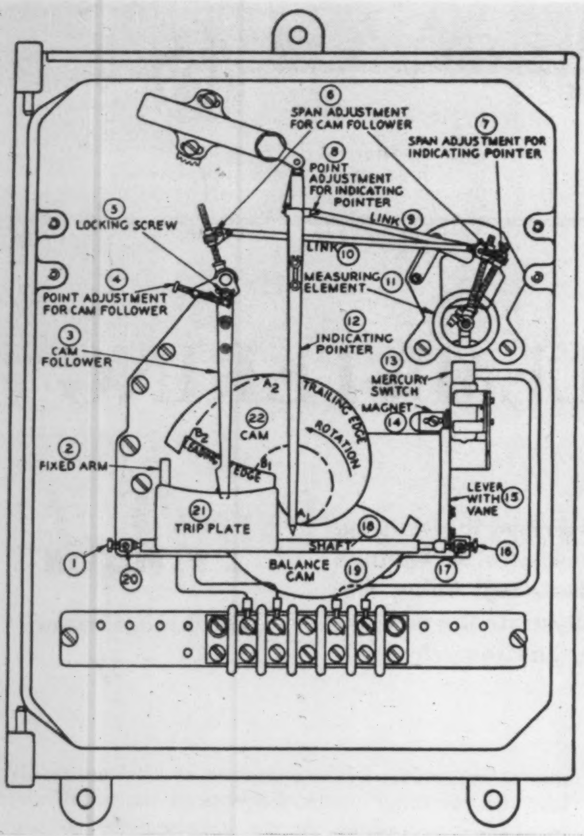
⑥ SPAN ADJUSTMENT FOR CAM FOLLOWER
⑦ SPAN ADJUSTMENT FOR INDICATING POINTER
⑧ POINT ADJUSTMENT FOR INDICATING POINTER
⑤ LOCKING SCREW
LINK ⑨
LINK ⑩
MEASURING ELEMENT ⑪
④ POINT ADJUSTMENT FOR CAM FOLLOWER
⑫ INDICATING POINTER
③ CAM FOLLOWER
⑬ MERCURY SWITCH
MAGNET ⑭
A2
TRAILING EDGE
㉒ CAM
ROTATION
B2
LEADING EDGE
B1
② FIXED ARM
LEVER WITH VANE ⑮
㉑ TRIP PLATE
A1
⑱
SHAFT
①
⑳
BALANCE CAM ⑲
⑰
⑯

Fig. 1. Metameter telemetering transmitter converts measured variable (such as pressure) into a pulse whose duration depends on the variable. Measuring element (11) positions both indicator (12) and cam follower (13). As cam rotates at constant speed it causes cam follower to move trip plate (21) in and out, thereby causing mercury switch (13) to open and close. Duration of switch closure is thus determined by amplitude of variable being measured.

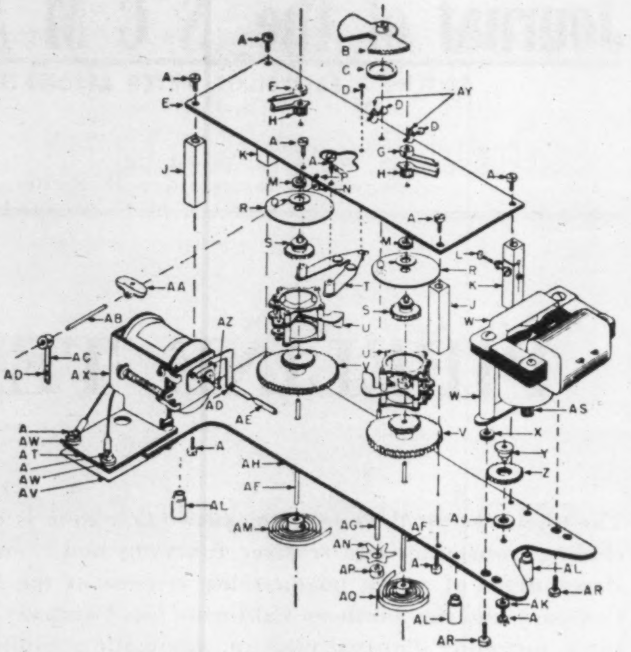
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Fig. 2. Receiver mechanism. Impulse energizes electromagnet AX (lower left), whose armature operates brake shoe AA, which operates one or the other of the differential-gear-cage assemblies U (center). This causes strike arms F-G to position gear H, which engages segmental gear B (top) whose shaft is linked to pen or pointer.

Fig. 4 shows a Metameter round-chart recording receiver. Fig. 2 shows an exploded isometric view of the receiver mechanism. The electrical impulse passing through electromagnet AX (lower left) actuates its armature, which alternately operates brake shoe AA, which in turn operates one or the other of the differential-gear-cage assemblies U (center). This imparts motion to strike arms F or G (top) which, in turn, position drive gears H. H meshes with segmental gear B (top) on shaft AG, whose motion is linked to the pointer or recording pen.

Interconnecting System

The interconnecting system may be any communication means that will transmit telegraph signals—a two-wire circuit, a single wire and ground return, a telephone simplexed circuit, phantom circuit, composite circuit, carrier-current channel, or radio, including microwave. Any circuit having bandwidth adequate for voice transmission may be subdivided into many individual telemetering channels. Each channel can transmit a continuous record, or it can be used for remote control if desired.

The telemeter circuit must be energized. In a two-wire circuit, the complete system is energized by a d-c power source supplying approximately 50 milliamperes. Fig. 3 shows such a circuit. In carrier or radio links, the telemetering terminal equipment is the same. However, the telemeter keys the transmitter, and the output stage of the carrier or radio system keys the telemeter receiver.

Remote Control

Remote control refers to the means by which an operator can change the set point of a controller, or adjust the position of a valve or regulator at a distance, using the communication channels available for associated telemetering equipment. Fig. 5 shows a pneumatic controller equipped with a cam operated by a reversible motor. The cam follower adjusts the set point of the controller in the same way that an operator would—by turning the set-point knob. The reversible motor can be actuated by a polarized relay (in a d-c circuit), coded signals or selective-call equipment, or by carrier-current circuits.

Where simple on-off action is required, the remote-set controller is not necessary, and modified supervisory equipment is used. Combinations of audio tones (or in wired circuits, combinations of plus and minus polarity) can handle large numbers of remote-controlled functions. These usually operate over single channels, thereby reducing line cost.

Systems

Some recent installations illustrate present-day practice. There are two distinct approaches to the application of telemetering in pipeline systems. One of these might be described as a *scanning system* in which the operator checks individual measurements throughout the system by means of switching or scanning devices which present one reading of a measured value at any given instant. This presentation is usually done on an indicating meter which the operator observes and logs manually. The system may also include remote control. The reasons for using the scanning system generally are dictated by the cost of communication facilities; the scanning system is most economical because it can operate over a communication channel having a narrow bandpass (such as 0-15

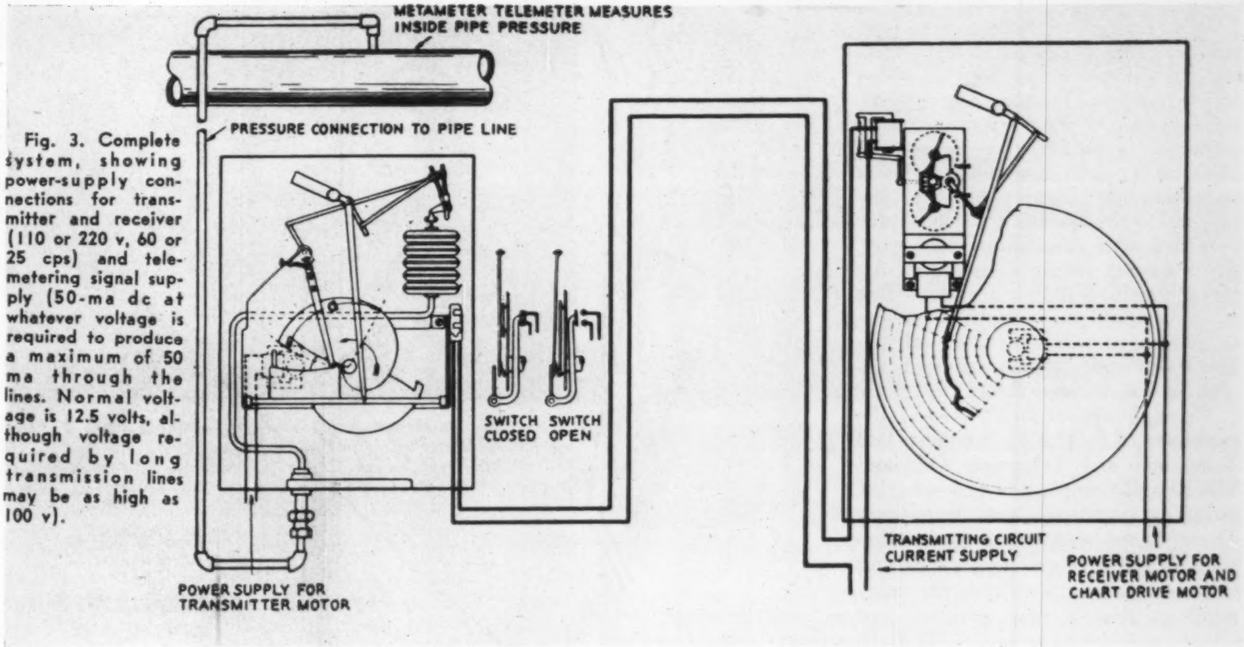

METAMETER TELEMETER MEASURES INSIDE PIPE PRESSURE
PRESSURE CONNECTION TO PIPE LINE
SWITCH CLOSED
SWITCH OPEN
POWER SUPPLY FOR TRANSMITTER MOTOR
TRANSMITTING CIRCUIT CURRENT SUPPLY
POWER SUPPLY FOR RECEIVER MOTOR AND CHART DRIVE MOTOR

Fig. 3. Complete system, showing power-supply connections for transmitter and receiver (110 or 220 v, 60 or 25 cps) and telemetering signal supply (50-ma dc at whatever voltage is required to produce a maximum of 50 ma through the lines. Normal voltage is 12.5 volts, although voltage required by long transmission lines may be as high as 100 v).

cycles per second). This system is flexible and may be extended as required to meet the demands of a distribution system. Its chief disadvantage is the lack of continuous records which can establish the trend of a flow, pressure, or similar variable.

More comprehensive coverage of the conditions existing throughout a system is secured by using a *continuous recording and supervisory system*. Such a system usually requires a separate communication channel for each record at the operating point. Where a large number of records are required, this may involve high communication costs. However, there are many installations where several measured values and control functions are combined in one location (such as at a substation), and these can be grouped together and transmitted over a communication facility of wide bandwidth (100-2800 cycles per second, for example). This wide-band channel can be subdivided into approximately 25 separate telemetering function channels by means of narrow-bandpass filters. The obvious advantage of this system is the continuous presentation of complete information of all values at the remote points, including chart recording of trends.

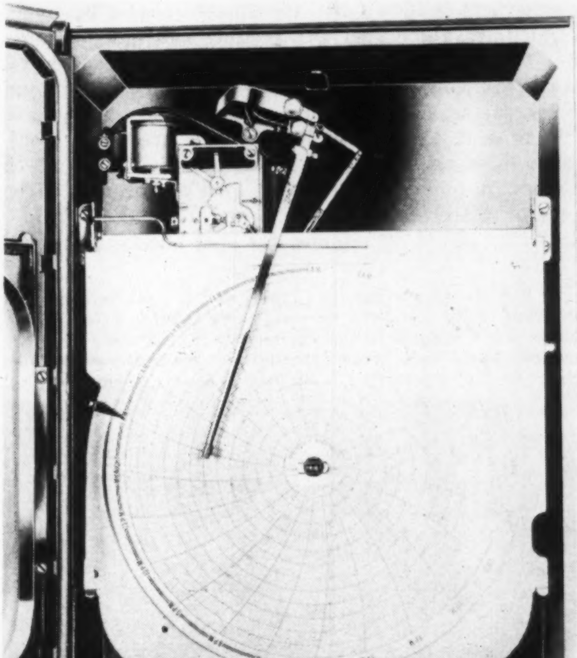


Fig. 4. Metameter round-chart recording receiver.

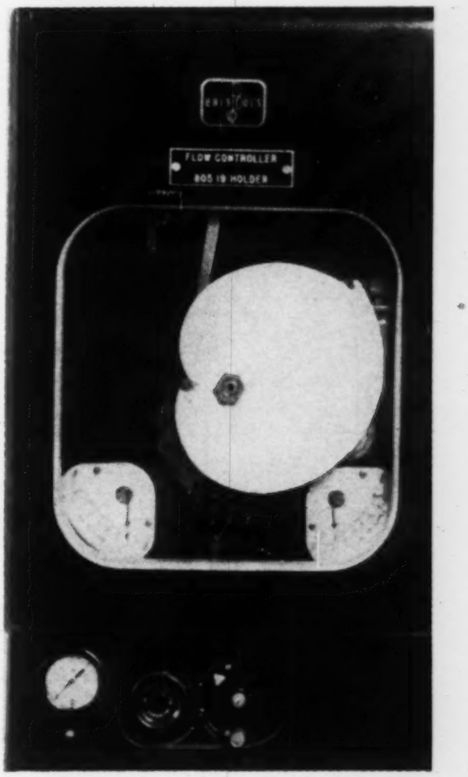
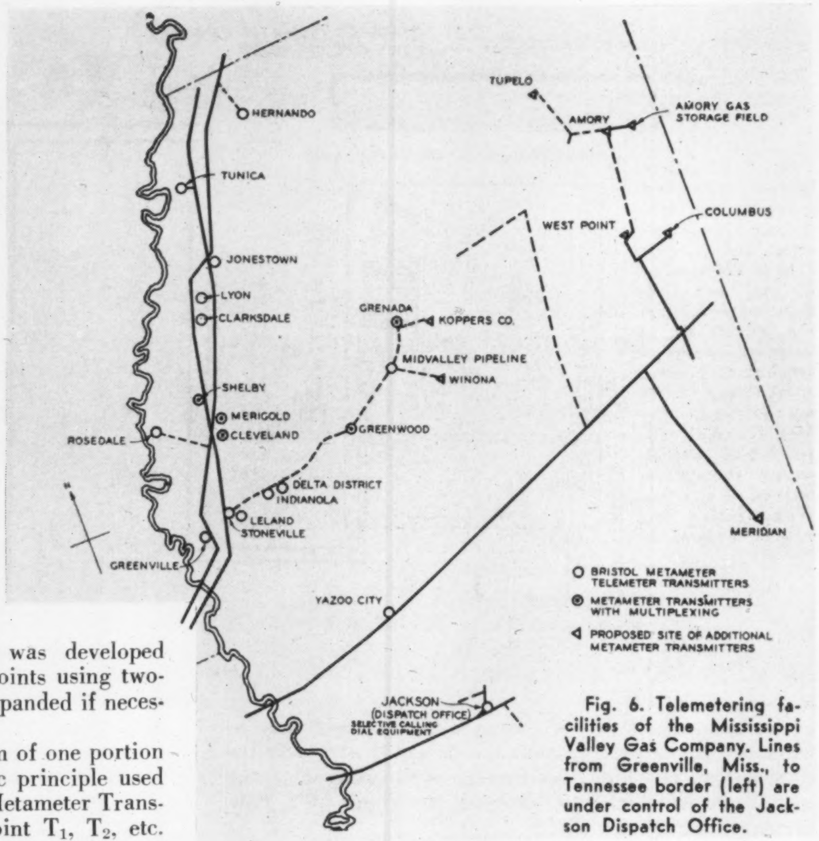

FLOW CONTROLLER
805 19 HOLDER

Fig. 5. Remote-set pneumatic controller of reversible-cam type. Cam follower adjusts set point by turning set-point knob.

Scanning System

As an example of the scanning-type system, the recent installation by Mississippi Valley Gas Company provides several points of interest. Fig. 6 (left) shows a map of the territory covered, extending roughly from Greenville, Miss., to the Tennessee border. It was required that natural gas be dispatched to the various areas and communities with maximum efficiency, while staying within a maximum demand specified under a system-wide contract with the supplier. At the same time, it was desired to sell the maximum gas possible without exceeding the demand figure.

Through cooperation between the engineers of A. T. & T., Southern Bell Telephone and Telegraph Co., and The Bristol Company, a new selective switching system was developed. There have been previous installations of selective calling systems, but this installation involved so many readings that a new selective system was developed which provides as many as 99 dialing points using two-digit dialing—and that number can be expanded if necessary.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MERIGOLD
CLEVELAND
ROSEDALE
GREENWOOD
DELTA DISTRICT
INDIANOLA
LELAND
STONEVILLE
GREENVILLE
YAZOO CITY
JACKSON
(DISPATCH OFFICE)
SELECTIVE CALLING DIAL EQUIPMENT
GRENADA
KOPPERS CO.
MIDVALLEY PIPELINE
WINONA
TUPELO
AMORY
AMORY GAS STORAGE FIELD
WEST POINT
COLUMBUS
MERIDIAN
○ BRISTOL METAMETER TELEMETER TRANSMITTERS
⊙ METAMETER TRANSMITTERS WITH MULTIPLEXING
◁ PROPOSED SITE OF ADDITIONAL METAMETER TRANSMITTERS

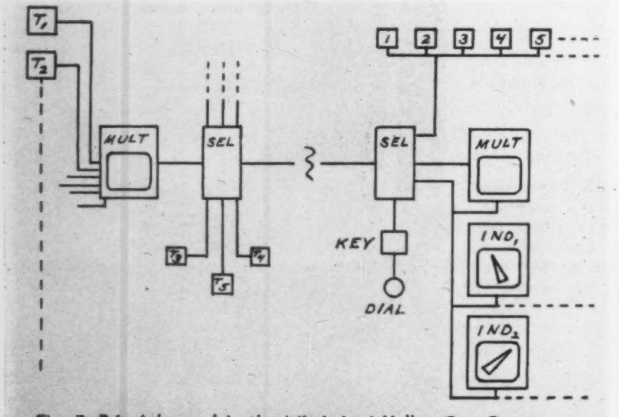
Fig. 6. Telemetering facilities of the Mississippi Valley Gas Company. Lines from Greenville, Miss., to Tennessee border (left) are under control of the Jackson Dispatch Office.

Fig. 7 shows a simplified block diagram of one portion of this system, which illustrates the basic principle used throughout the entire system. A Bristol Metameter Transmitter is installed at each measuring point T_1, T_2, etc. In each area where there is a convenient group of transmitters, the telephone company has installed one of their new selector devices, which is connected to each transmitter as shown in Fig. 8. A special multiplex arrangement allows the operator to dial the multiplex unit at that point; the entire group of transmitters is scanned in series without requiring the operator to dial each one individually.

Dispatching Facilities

At the dispatching headquarters in the Jackson office (Fig. 9) the operator has a panel on which are seven Bristol Metameter dial pressure indicators and suitable flow indicators. Also installed at this point is a Bristol Multiplex Receiver, which sorts out the incoming signals from the multiplex transmitter and connects them to the proper indicators as each signal comes through. In addition, the operation at Jackson has a duplicate selector which operates at the same time when any remote point is being dialed. The local selector first connects the correct receiver to the line for the value being monitored. Next, the light showing the location of the town where the transmitter is operating, is energized. Simultaneously, another light shows what value is being measured and, finally, the light inside the particular receiver in use for that measurement is turned on. The operator has a manually operated key which holds this reading as long as desired; after the reading is logged and observed, the key is released, restoring the system to its original condition, and another station code number is dialed.

At present, approximately 50 points are being monitored; these can be logged by an operator in about 15 minutes. A quick calculation of load conditions can be made on a special calculating board in another 15 minutes. This leaves 30 minutes for spot checks of critical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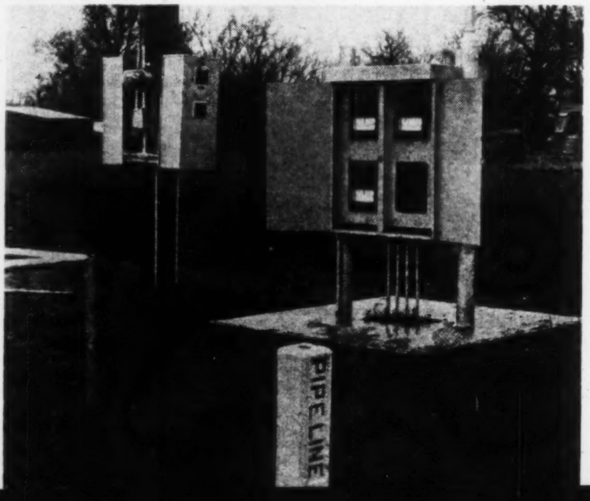
T2
MULT
SEL
T3
T5
T4
1
2
3
4
5
SEL
MULT
KEY
DIAL
IND1
IND2

Fig. 7. Principle used in the Mississippi Valley Gas Company system, a new system which provides as many as 99 dialing points using 2-digit dialing.

Fig. 8. Metameter transmitters (connected to each variable) are connected to the telephone company's new selector device at this Greenwood, Mississippi station. The selector is used where there is a group of transmitters. When operator dials the multiplex unit, the entire group of transmitters is scanned in series, automatically.



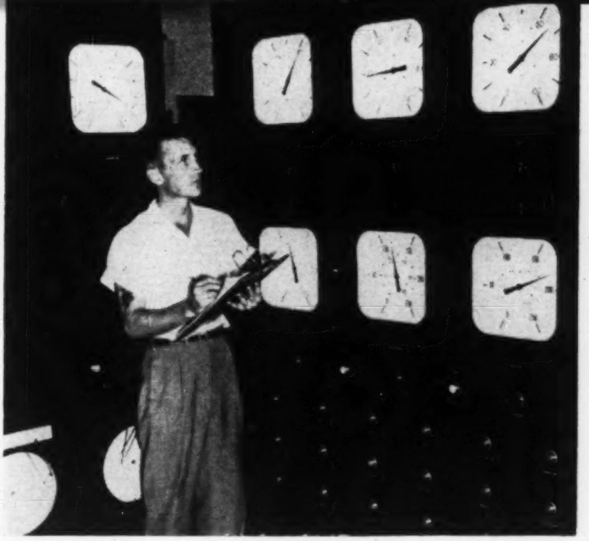


Fig. 9. Dispatcher's office at Jackson, Miss. (see bottom of Fig. 6) contains Metameter receivers and lamp indicators. Lamps indicate location of transmitter being interrogated, and variable being measured. Lamp in receiver indicating the measurement also lights simultaneously.

points or dispatching operations before the next complete hourly survey of the system. Details on the communication facilities are covered in a paper (A.I.E.E. Winter General Meeting, New York) "A Fully Selective Telemetering System Employing Telegraph Facilities," paper No. 55-167, by Mr. C. W. Smith, of A.T.&T. in New York, and Mr. M. E. Forrest Jr., of Southern Bell Tel. & Tel. Co., Atlanta, Ga.

Digitized Readout

An interesting extension of the scanning system of telemetering is now possible as a result of the recent announcement by Bristol Company of a new Metameter Receiver including a digital readout device (Fig. 10). By combining digital readout with the scanning system outlined, and by adding a motor-driven scanning switch to replace the operator dialing the individual transmitters, it is possible to provide a continuous scanning system which delivers a printed record of the reading at each point in the system. If required, this could be translated into a punch-card record. Emergency alarms also can be provided with this continuous scanning to warn operators in event any reading approaches a preset alarm figure.

Continuous Recording System

A continuous-recording and supervisory-control telemetering system is shown in a simplified block diagram in Fig. 11. This shows the essential features of an installation now operating in the Southern California Gas Company system between the Spence Street Station dispatcher's office and the Hollywood Sub-Station. With this equipment the operator at Spence Street has a continuous record of all measured variables in the Hollywood Street Station, including pressure, flow, holder height, etc., as represented by Transmitters T_1, T_2, etc. These readings are continuously transmitted over narrow-band tone channels by tone transmitters F_1, F_2, etc. The entire group of readings is transmitted over one voice-quality telephone channel having a band pass from approximately 100 to 2800 cycles per second. At the receiving point, narrow-band receivers separate the various tones and translate them into signals to operate the recording Metameters R_1, R_2, etc.

In addition to this continuous recording of the remote values, the operator at Spence Station has available additional communication channels (using other phone subchannels) which in turn operate relays at the Hollywood Station (X_1, X_2) which in turn raise or lower the set points on the controllers (C_1, C_2) or open and close valves by means of electric air pilots (P). Combined with this control mechanism is a monitoring light system so that the operator has full knowledge at all times of the condition of valves and controllers at the remote point. This particular supervisory control system uses a combination of three tones in sequence to operate any control function. This provision eliminates possibility of accidental operation of the control through cross talk or random noise interference on the communication channel.

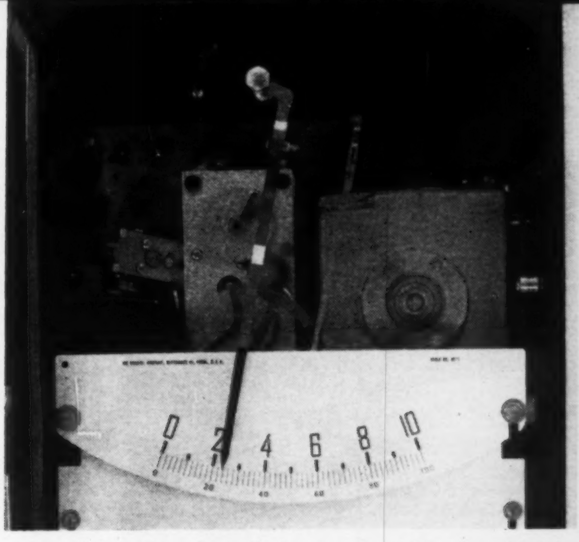


Fig. 10. Digitized readout of telemetered variable is provided by Metameter indicating receiver with Giannini digitizing commutator.

Digital readout and printed tabulation of values also can be combined with the continuous recording system if desired.

The systems described offer to industry basic elements for remote reading and control which can be combined in an infinite variety of combinations to meet the requirements of industrial applications.

Acknowledgments

The author acknowledges with thanks the assistance and cooperation of Mr. W. Worsham, Transmission Engineer, Pacific Tel. & Tel. Co., Los Angeles; Mr. Glen Wilson, Instrument Engineer, Southern California Gas Co., Los Angeles; Mr. W. E. Rufleth, Application Engineer, The Bristol Company, Waterbury, Conn.; and Mr. L. B. Lumpkin, District Manager of The Bristol Company, Birmingham, Ala.

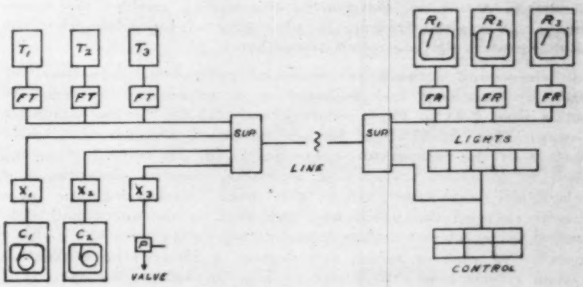
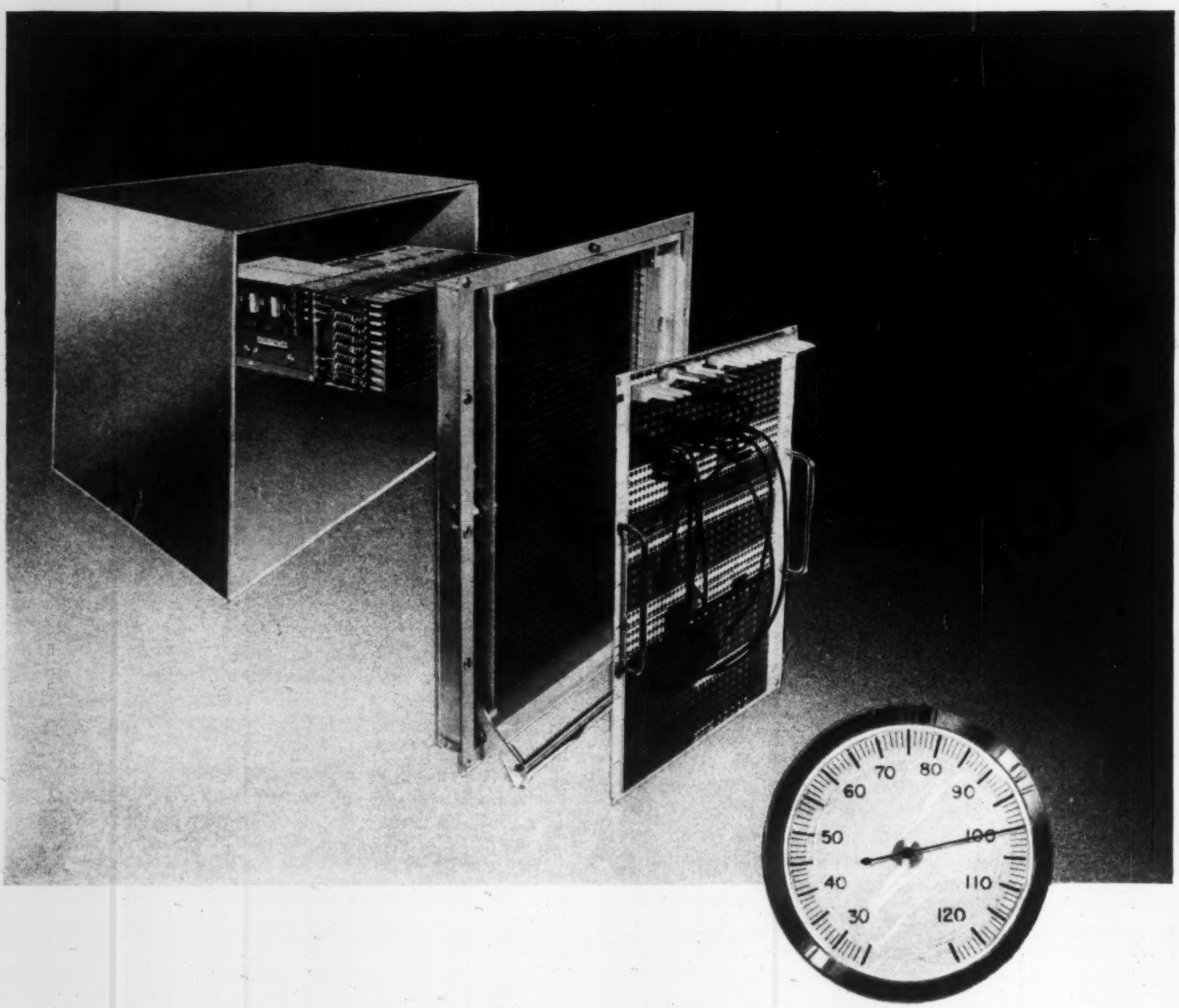


Fig. 11. Telemetering system with continuous recording and control of several variables over one communication channel. Transmitters (T) are connected to variable. Tone transmitters (FT) permit the telemetering of the several signals over one voice-channel (with bandwidth of 100 to 2800 cps) by converting each signal into a narrow-band tone. Receivers (FR) separate the tones and convert them into signals for the recording Metameters (R). Operator can set controllers (C) remotely via relays (X), or can operate valves remotely via pilots (P).



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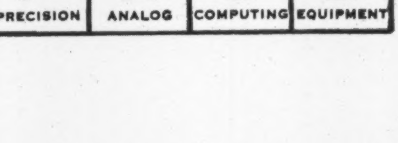

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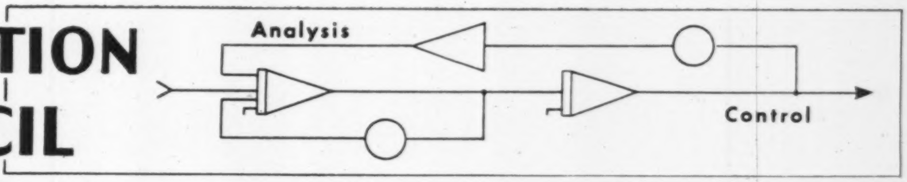

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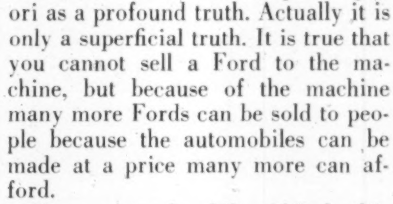
Bits

You have all heard the repartée attributed to Walter Reuther when he was shown a very impressive automatic machine in the Ford plant. His proud host is said to have challenged, "Let's see you organize that worker," to which Reuther is supposed to have rejoined, "Let's see you sell it a Ford!" Now whether Reuther made such a smart-aleck remark or not, it is good for a chuckle. Trouble is it's so clever that it is accepted a priori as a profound truth. Actually it is only a superficial truth. It is true that you cannot sell a Ford to the machine, but because of the machine many more Fords can be sold to people because the automobiles can be made at a price many more can afford.

If we sound philosophical this month it is probably a hangover from working on the tape recording of the May meeting of the Western Simulation Council. This meeting was typical of some which cause us occasionally to be called the Stimulation Council. We settled nothing—did not expect to. The recording sounded like a bunch of people thinking out loud, not always coherently. There were some silly remarks, but there were also many worthy of serious consideration. We have not cut the text as drastically as usual because we think that the contrasting points of view—the variations on the theme of "Optimization"—are thought-provoking, stimulating!

Pieces

Forty-two representatives of 19 organizations assembled amidst architectural and natural beauty for the May meeting of the Western Simulation Council. The location was the new Motorola Research Laboratory on the outskirts of Riverside, California. The building, like the new plants of Beckman in Fullerton, Consolidated Engineering in Pasadena, Librascope in Glendale, Ramo-Wooldridge in Los Angeles, and others, is an inspiring example of the combining of beauty and utility. And as if this were not enough, Motorola is surrounded by orange groves—in bloom when we were there.*



New Motorola Research Lab

Otis Updike (US Naval Air Missile Test Center, Pt. Mugu, Calif.) opened this, his last meeting as Chairman, by introducing John Hart, who welcomed us on behalf of Motorola. Hart regretted that he could not explain the work of the Laboratory because ours was an unclassified meeting, but added that we would be able to get a good idea of their capabilities and field of operation on the tour of the facilities. They have been in their new laboratory for about five months.

Referring to the announced topic, "The Use of Computers for Systems Optimization," Otis guessed that there were probably as many definitions of system optimization as there were groups present. Therefore, he started the discussion by asking Norm Irvine (Aerojet-General Corp., Azusa, Calif.) what his idea of system optimization was.

Irvine on Optimization

Norm said that would depend on the type of problem you are considering—that Dr. Franz Zwicky, a consultant to Aerojet-General, has a technique involving morphology (the science of forms and their variations). Norm said if we have a production type of system it might be optimized in one way, whereas with a simple servo system we might be interested in different criteria such as getting a minimum rise time with a minimum amount of overshoot. If the system is linear there are certain definite limitations as to how much it can be improved. If nonlinear techniques are used, as Dr. R. S. Neiswinder has used them at Aerojet, simulation proves extremely useful.

---

*All this and perfume too! Soft music and dancing girls are probably planned.

Norm illustrated by sketching a second-order system on the board in which he specified the percent overshoot to a step function and the decay time. If the optimum with the linear system is not good enough, it cannot be improved because if the rise time is decreased, the overshoot will increase, as will the decay time. But nonlinear systems can be designed to have a fast rise time, no overshoot and, consequently, low decay time.

But what, asked Norm, does this do to your sine-wave response? He said he tried it with a computer servo system and got fairly good frequency response with a linear system which produced reasonably good sine waves. Then they modified the system to be nonlinear and applied sine waves. When the traces from a Brush recorder were compared, without careful measurement, it seemed that there was no difference. Optimization, Norm says, depends on what you want to get out of a system.

Otis remarked that a definition of optimization involves a certain amount of philosophy, and how you define the problem. Linear programming has some relationship to system optimization. In both cases there is first a survey of the technology to determine the limitations within which one must work, then a statement of the objectives. For example, in a missile system the objective may be to minimize miss distance, or it may be the best envelope of positions from which the missile can be fired. The sequence is to set up the limitations, establish the objectives, and then determine the criteria of success.

Mike Foley's Comments

Otis asked Mike Foley (Western Precipitation Corp., Los Angeles 15, Calif.) if he had any ideas on the subject. Mike answered that there are two forms of optimization, one in which you attempt to build the best mousetrap under a given set of conditions. In the other you attempt to build a machine that will do the best that can be done no matter what the conditions may change to.

Otis remarked that this was a higher order of optimization, wherein a machine would continuously follow the optimum. To him there appeared to be several types of optimization. In one you might wish to optimize the configuration to perform a given function. Here you wish to change the flow of energy within a system; this is the circuit design problem. In another system you might wish to determine the optimum initial conditions. In a third you may want to optimize parameters within a system. These appear to be three major cases from a more general group of operations.

Bill Waddell on Criteria

Bill Waddell (Giannini DATEX Corp., Pasadena, Calif.) said that if we keep on talking about "optimum" we "ain't going to talk about nutting at all." It must be broken down into the set of criteria by which you are going to operate.

Otis got a good laugh by paraphrasing Bill's observation—"Optimizing the criteria for optimization."

Bill said there were definite criteria, and referred to "Optimizing Criteria" by Dunston Graham.[*]

"When a person simply says optimize," Bill continued, "he could mean anything. For instance, when I say optimize I mean take out all possible equipment. I want the least amount of equipment that will give me 'a answer,' whether it is a precise answer or not."

Otis went to the board to list possible criteria, suggesting that Bill's minimum equipment might be one. Bill said he was not worried about cost—"that is the accountants' problem." Otis insisted that cost would have to be a criterion, because cost cannot be allowed to go to infinity, but that Bill could put a small coefficient on it if he wished. To make it simple, he continued, if you have a three-variable problem the boundary conditions on these criteria may be represented by areas on a map. There should be a region of overlap satisfying all three criteria. This area of overlap can then be searched for an optimum.

Otis asked for some more criteria for his list. The suggestions which followed indicated that some were inclined to group criteria and come up with something like performance, whereas others wished to subdivide as far as possible. The final list looked something like this:

Simplicity
Reliability
Cost
Accuracy
Speed (frequency response)
Size
Weight
Power (efficiency)
Development and Production Time
Material Availability
Serviceability

Looking at the list, Otis said the reason for spending so much time on it was that determining criteria is surely an important, and possibly the most difficult, problem of optimization.

McLeod asked Otis if he was trying to suggest that some engineers should stop and ask themselves: "What the heck am I trying to do?"

Otis replied that he thought it might be a good idea.

There were shouts of "Unfair!" but Otis, undaunted by the cries of the multitude and entirely heedless of his own popularity[*], said not only that they should do this, but that they should do it at "optimum" intervals!

Gehrig Suggests Simplification of Criteria

J. J. Gehrig (Northrop Aircraft, Hawthorne, Calif.) suggested that just the words "effectiveness" and "cost" could replace all these things we were talking about, cost being taken in the largest sense to mean man hours, weight, or whatever you might have to pay to accomplish your objective.

He agreed that there are two ways to optimize—for example, if a proposal is to be submitted for an interceptor, the Air Force might specify certain boundary conditions or they might leave the question wide open. But in either case you must always consider the price, because if you want badly enough to do a job and you are able to pay the price you can always do it.

Waddell claimed that at the beginning you should not consider the cost at all. You should consider whether or not it is possible to build an optimum system.

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[*] We have a letter from Bill mentioning "The Synthesis of 'Optimum' Transient Response: Criteria and Standard Forms" by Dunston Graham and R. C. Lathrop, Paper No. 53-249, as well as "The Principle of Optimizing Control Applied to Analog Computers," master thesis by Lieutenants Seusy and Heerman. These papers can probably be obtained by writing Dr. C. Zieman, Head, Electrical Engineering Dept., Resident College, U.S.A.F. Institute of Technology, Wright-Patterson Air Force Base, Ohio.

[*] He is not running for reelection.

Mike Foley pointed out that perhaps we were assigning the same value to each one of our criteria, whereas in actual practice it is necessary to assign different values.

Otis agreed, and illustrated by saying that if we called these criteria A, B, C, D, etc., they would be related by an equation in which each had a coefficient and an exponent. It might develop that some of the coefficients will be zero, or negligibly small, as for instance the criteria of size and weight of ground equipment. This is easy to see if there are two or possibly three related criteria, and there are even techniques for handling them if they are multi-dimensional.

Yopp Postulates a Specific Problem

W. B. Yopp (Douglas Aircraft Co.), who suggested this topic at the last meeting, said that, as computer people, we were not interested primarily in the design of the components nor primarily concerned with the technology. He postulated a problem more in his line. There is an airplane with a certain pay load, range, and speed, and they must put an autopilot in it. The autopilot must do such and such. The computer man has a number of variables to take into account. What Yopp wants to know is how he can get the best compromise between his feedbacks and the other parameters already defined.

Otis observed that how much a computer man is concerned with what criteria is a matter of where he works and what kind of problem he has. Sometimes he may be able to say nothing about the parameters which are presented. But there are other times when the computer man can and should play a part in determining these parameters.

Gehrig said Yopp's problem was no different from anyone else's! (Cries of "Hear, hear!") He thinks that we should generalize the problem because we always have the boundary conditions.

Otis agreed, saying that in some cases we may be working with a very limited part of a block diagram, but that there should be some feedback of design information, as well as feedforward. Anyone is handicapped with too many constraints.

Bemer on Over-all Perspective

Bob Bemer (Lockheed Aircraft Corp., Missile Systems Division, Van Nuys, Calif.) agreed, saying that you might have a multi-variable system in which some constraints are not known to the other people; they do not know whether the maximum peak exists within the specified area or not. You may optimize and come up with a little local peak, whereas if they had some feedback from you there may be a big peak that you can get to if the original constraint can be modified. Sometimes it might be possible to vary each one 1% and get a 10% over-all improvement.

Concurring, Otis illustrated with his diagram of areas, showing possible improvement if there should be some latitude to the constraints—a powerful argument for the systems approach!

McLeod asked Bemer whether he was suggesting that we find a way of evaluating the constraints rather than going into a problem with set constraints. If we can devise a method for evaluating constraints, then we have opened up an entirely new area.

Bemer answered that if you are concerned with a parameter study you certainly should consider all of the fringe areas beyond the given boundaries.

Bill Waddell said that he handled such problems from the systems design point, and that the first thing to evaluate in every problem is the ranges of the boundary conditions.

McLeod observed that the trend of the meeting was to keep coming back and focusing attention on criteria and the weighting of the criteria. If you can do that you have most of the problem beat. Is not the problem of optimization really the determination of the criteria and then the evaluation of the coefficients and exponents?

Irvine Asks For Specific Techniques

Norm Irvine said he would like to change the trend of our philosophical discussion. Instead of attempting to determine what optimization is, let's just assume that we wish to come as close as possible to a certain goal. Then how do we handle the computer program to know when we have accomplished this? Going back to the second-order servo system, suppose we launch into a computer program to try to optimize some of the parameters. Is there some established technique by which we can accomplish this, or do we just go in blindly, changing variables systematically in a brute force method? Is there some quicker technique?

Bemer suggested that we use our heads. (Heresy again!)

Otis said he had intended to come back to that after we had dived into the philosophy enough to be sure we knew what we were talking about. We receive or devise criteria, then we search for a way to locate the maximum or minimum of a criterion. Here the calculus conditions our thinking. Then, perhaps, we should go one step farther and see how big an area we have around our chosen point in which we do not depart further than the noise level of our data. In other words, do we have a very sharp and sensitive peak, or do we have a broad plateau so that we can set our variable for an optimum and then normal production tolerances and maintenance variations will still leave us optimized?

Norm said he could partially answer the question he originally raised. The morphological approach as far as he knows allows you to go through all possible combinations and rule out certain areas. Does anyone know any other way of approaching the problem?

Otis said it boils down to this: we set up objectives and criteria, and determine our constraints from technology and elsewhere. Then we find

Jerry Jacobs (standing) discusses a practical case of optimization, evoking deep thoughts in Myrtle Knauf of Motorola (A), Mike Foley of Western Prec. Corp. (B), Bill Waddell of Giannini (C), Niels Christensen of Firestone (D), W. Yopp of Douglas Aircraft (E), and S. Cooper of Motorola (F).

ourselves with some fields mapped out in which we believe our optimum or optima lie. What is the best search technique? What is the optimum search for optima?

Bemer, our "head" man, again suggested that drawing a few curves and making some predictions works out pretty well. Using a computer to optimize this optimization search would take so many years that we couldn't afford it.

McLeod said this wasn't necessarily so. You might often be confronted with problems of the same type, but with different values of constraints and criteria. In such a case it might pay to take the time to set up the computer so that thereafter all you would have to do would be to drop in a different deck of cards or change the adjustment on some pots to get your optimum.

Otis said we can build on experience and thus get a nonlinear gain in knowledge. We can find methods for solving standardized problems and then devote our brain power and time to improvement of the programs.

Bemer said one of the better methods of searching is to lay a coarse net over the map and assign each variable maybe three values and take those in combination. This gives you a rough topological map wherein you can search locally. This the computer can do.

"If we apply the theory of games," Otis asked, "would we not perceive that instead of laying a net we should pick random points and examine these?"

Bill said he considers search techniques in two classes: the intuitive and the mathematical. It doesn't matter which you do first.

Otis added that actually you often alternate between the two.

Mike Foley said you would probably use the intuitive search first to find the region of interest, then use the mathematical search. If you start with a mathematical search it might be next year before you begin to see the picture. Mike said they have been able to make quite a few short cuts by using graphic analysis as much as possible. Then you are able to see the picture as a whole, instead of the minute quarter which you might be concerned with in mathematics.

Otis observed that most of us are probably geometry-minded; certainly he is.

Refreshing Intermission

An intermission was then called, and we all went out to the canteen for refreshments, which were served in a unique manner. The canteen is mechanized (as is fitting and proper), and it takes dimes to get things. But Motorola said we should be their guests, so when we went out we found lovely ladies with a great many dimes, which they obligingly shoved into the designated slots to serve us. Thanks, Motorola!

Otis opened the second half of the meeting by explaining to those who had not attended a Simulation Council meeting before that we do not mind sounding off even when we don't know what we're talking about. "Shuck your shyness and let us hear from you," he said. "Your comments, even though they prove naive, may serve to bring out the answers to questions from others."

Jacobs on Practical Possibilities

He then asked Jerry Jacobs (Hughes Aircraft Co., Culver City, Calif.) to tell us some of the discussions he had had during the break. Jerry replied that he thought optimization should be put in terms of an economic man, defined as one who seeks pleasure and avoids pain, masochists notwithstanding. With computers and systems it should be the ratio of effectiveness to cost. Our discussion so far has been unrealistic in that it assumes that we can list n or $n + 1$ factors which are important, and knowing how they are functionally related one can use determinate procedures of mathematics and find a maximum. This is never the case with any practical system because nobody can completely specify a system. The best you can do in the hyperspace of n dimensions is to divide the hypervolume into two hypervolumes: one wherein the specifications are given and the other where they are not. Besides this simple division no optimum actually exists. Having done this you can devise new specifications to limit the volume still further—and if you ever diminish the volume to a point we will all be long dead. So we should break off this philosophical discussion and start worrying about two or three variables. How do you then find the region where people are happy and the other where they are not, using a computer?

Otis agreed that it was time to get to practical cases.

S. E. Cooper (Motorola) said it seemed from conversations during the break that everybody thought optimization should produce the best possible system obtainable. He doesn't feel this way. For instance, consider a passive linear network wherein you want a given response for a given excitation. Let's say that you are able to arrive at your exact response with 18 elements. If you wish to arrive at that response with the least number of elements, then you must look for superfluous elements. Suppose you can cut the number to nine—that still doesn't mean you have reached the optimum. If you can *approximate* the response with *fewer elements*, then that might be the optimum.

Agreeing, Otis showed how this fitted in with the idea of applying coefficients and exponents to our previously listed criteria.

McLeod thought that Jacobs and the others who urged a return to practical problems were right, so he suggested that Jacobs lead off by showing us how he would handle his two- or three-variable problem, in terms some of us might be able to understand.

Bill Waddell asked what type of search technique we were talking about. If we take a square root with a digital computer, we get a solution a_n, then a solution a_{n+1}. The magnitude of the difference may be a criterion. If the difference is less, the solution is good enough. Is that the type of specific thing we are talking about?

This pitched us back into a discussion of the philosophy of what optimum means, whereupon Otis observed that "the Greeks, who were pretty good at this sort of thing, argued for centuries as to the nature of truth. Optimum is a similar sort of thing."

A Filter Design Problem

Jerry got back to his example and considered the design of a filter having three variable parameters. Specifications limit the percentage overshoot under a given set of conditions as K, T_1, and T_2 are varied. He then asked Irvine if in his nonlinear servo illustration the performance was limited to a certain-sized step input.

Norm said generally yes, that it depended on the system.

Jerry specified transient less than n% and that the system be stable. He sketched a three-dimensional space, the ground plane being the two time constants T_1 and T_2, and with the gain vertical. Considering only the first criterion, there is a certain volume in this three-dimensional space which defines values of these three parameters wherein the overshoot is less than n%. Then if we consider only stability we will get another volume which defines combinations of the parameters for which the system is stable. So if the two volumes intersect within that region, combinations of the parameters will satisfy both criteria. To further select the point defining the best parameters to use would require more criteria—for example, a minimum static error, or at least m% tolerance on the time constants. Because we could go on forever inventing new specifications, we can never completely specify the system. Therefore, to put down all criteria first and then try to define a point is prohibitively complicated. He advocates selecting two or three criteria to get under way and then limiting further as we go along. In practice, families of curves rather than three-dimensional drawings are usually used.

Updike on Possible Computer Technique

Otis complimented Jacobs for a fine discussion of an attack on a concrete problem. But he would like to get even closer to our problem and consider the computing hardware that has been used. Many problems of this nature, where the discontinuities of constraints dominate the picture, would undoubtedly not warrant setting up the computer. But certainly some would. There are a couple of papers in which this sort of thing has been touched on, one in the proceedings of the Wescon of 1954 by Louis Wadel (Chance-Vought Aircraft, Dallas, Texas) and the other presented at the 1955 Western Computer Conference by Wadel and Wan, dealing with automatic iteration with analog computers. If criteria could be put in suitable form, computers could thus search a region and test to see if criteria have been met.

Otis suggested that as an example, in the examination of a filter such as had been described, a repetitive computer may be used and the response curve displayed on a scope face masked to fit the tolerances. If the desired response curve, plus-or-minus tolerances, were masked off and watched with a photocell, any solution showing light outside the mask could be discarded.

Norm observed that in his case the "mask" had been a human being. Otis said yes, that seems the usual practice at present.

Bill Waddell said something similar was done by Askania Regulator Co. in Chicago, and by Dick Lathrop at Wright Field.

Otis said that if we could set such a problem up on an analog machine with servo pots, or fixed resistors and stepping switches, we might push a button at four o'clock, stand around for half an hour to see that everything is OK, then leave. Next day we would return to find the region that fits the conditions recorded.

Gilbert Kemp (Convair, Pomona, Calif.) wanted to know how Otis would make the machine know which way to step the relay. Several methods were discussed, depending on the criteria.

Brute Force Vs. Brain Force

Otis reminded us of what had been referred to as a brute force method wherein a coarse grid is laid out and the computer is caused to step along it, then go back and make successively finer investigations. This technique reminded Otis of the game "Salvo" in which, if you go along correcting your blind shots at the target according to a perfectly uniform coordinate grid, you are likely to lose the game. There is a better strategy which might be derived from game theory.

Otis Updike steers his final meeting as Chairman of the Steering Committee.

Waddell said we should set up a digital computer to select the strategy and then run the problem on an alalog computer.

Bemer agreed that this was not at all unsound.

Otis observed that if you have a computer which will run very fast you can whip out thousands of solutions by brute force methods. Then the problem boils down not so much to how you set it up as to how you examine it to see if criteria are met. With slower equipment you must be more subtle.

Hans Meissinger (Hughes Aircraft Co., Culver City, Calif.) referring back to the mask method, remarked that it might be feasible to set up a function which meets the requirements and play it into the machine, compare it with the repetitive solutions, and evaluate the error integral.

McLeod observed that unless you have a very fast machine, so that the number of "experiments" which you can run is unlimited, you must use some statistical method for planning the experiment. But if you do have a fast machine you can go ahead with what we have contemptuously referred to as "brute force" methods and take advantage of the power that we have in the computer. Sometimes this might be best.

Bob Bemer, still in favor of using our heads, demurred. "If you have, as somebody mentioned, an 18-parameter problem and you examine it half as finely as you otherwise would, you are saving 2^{18} searches. Even on a very fast computer that 2 to a high power makes the method unfeasible as compared to using your head. You can *never* afford a direct brute force method.

Otis said there were many techniques that could be discussed. Perhaps we should get into such things as linear programming, regression analysis, and combinatorial analysis, but that we would have to continue this discussion some other time.

Politics

With this meeting Norm Irvine, elected Vice-Chairman of the Steering Committee six months ago, succeeded to the Chairmanship, as is our practice in the Western Simulation Council. After an unsolicited and unappreciated campaign speech in which your editor pointed out that Bill Waddell, as a great proponent and practitioner of our way of airing half-baked as well as other sides, would be an inspiring leader for the less vociferous of us, Bill was elected to the Vice-Chairmanship, to succeed Norm.

Information (Without Theory)

Each month we have been hoping to be able to give you the story of an extremely interesting and important panel discussion, "Possible Effects of Automation On Our Way of Life," sponsored by the Industrial Analysis and Control Council and the Engineering Department, University of

SIMULATION COUNCIL

California at Los Angeles. Your Secretary made a tape recording of it, and after having worked like mad putting the act together, Stuart Schy (Librascope, Glendale, Calif.) was gracious enough to offer to have it transcribed. But Stu, like the rest of us, has been too busy. So if you are interested in hearing what a representative of the Junior Chamber of Commerce, an economist, an engineer-president, and a labor spokesman have to predict about the impact of automation on our way of life, we will lend you the tape if you will have your Gal Friday transcribe (not edit) it for us.

And speaking of Automation brings to mind the cartoon by Lichty showing a personnel man speaking to the President of Tootle Valve Company: "A guaranteed annual wage, a guaranteed annual bonus, a guaranteed pension plan is fine with the employees, chief . . . Except they would like a guarantee you won't go broke . . ."

We (not the editorial we, but Suzy and me) went to the Electronic Components Conference banquet in the Cocoanut Grove last month. A debate "Resolved: Transistors Will Soon Replace Most Tubes" was scheduled, but our real interest in going was to dance to Xavier Cugat and see his floor show. The dancing and the floor show were tops in their field, but were second-rate entertainment compared to the show put on by Simon Ramo as moderator, Harper North and Louis Ridenour for the affirmative, and W. R. G. Baker and C. S. Irvine for the negative. "The results," as Dr. Ramo so aptly put it, "Were debatable," but the performance was excellent. I would like to be their agent!

Thots (to think about)

Heard over a tequila in Hussong's Cantina way down in Baja California, Mexico, a remark which might appropriately be made at some "conferences" we have attended, "We can speak freely, unhampered by the facts."

Which, for some not-at-all appropriate reason, reminds us of a quotable quote from the SAE Journal: "Technology advances by creating a realization of new areas of ignorance," and the statement by W. W. Smith of GE: "The greatest value of the computer to date has been its stimulus to creative thinking."

Computer Events

other events
on page 1100

Western Simulation Council
Date: Tuesday, 23 August 1955, 1:00 P.M.
Place: Berkeley Scientific Division of Beckman Instruments, 2200 Wright Avenue, Richmond, Calif.
Subject: "High Precision Techniques". This is expected to cover such aids to precision as automatic setup, the incorporation of digital methods, and checking techniques. No Security Clearance required!

Western Simulation Council
Date: Thursday, 10 November 1955
Place: Beckman Instrument Co., Fullerton, Calif.
Subject: "Simulation with a Human in the System"

Midwestern Simulation Council
Date: Monday, 15 August 1955, 1:00 P.M.
Place: Wright Air Development Center, Wright-Patterson Air Force Base, Ohio
Subject: "Cute Tricks in Simulation" —Demonstrations of equipment will be featured. Contact: Dr. L. M. Warshawsky, c/o Commander, Wright Air Development Center, Attn: WCRRU, Dr. Warshawsky, Wright-Patterson Air Force Base, Ohio.

University of Michigan—Summer Session
Dates: 1-12 August 1955
Subject: "Digital Computers and Data Processors—A Report From The Users". Contact: John W. Carr, Digital Computation Dept., Willow Run Research Center, University of Michigan, Ypsilanti, Mich.

University of Wisconsin
Dates: 17-19 August 1955
Subject: "The Computing Laboratory in the University". Contact: Preston C. Hammer, Numerical Analysis Laboratory, University of Wisconsin, Madison, Wis.

Symposium, sponsored by Stanford Research Institute and National Industrial Conference Board
Dates: 22-23 August 1955
Place: San Francisco, California
Subject: "Electronics and Automatic Production". Contact: Stanford Research Institute, Palo Alto, Calif. or the National Industrial Conference Board, 247 Park Avenue, New York, N. Y.

Massachusetts Institute of Technology
Dates: 22 August-2 September 1955
Place: Cambridge, Mass.
Subject: "Numerical Control of Machine Tools. Contact: Summer Session Office Room 7-103, Massachusetts Institute of Technology, Cambridge 39, Mass.

WESCON
Dates: 24-26 August 1955
Place: Civic Auditorium, San Francisco, Calif. Contact: W. A. Edson, Applied Electronics Laboratory, Stanford, Calif.

Association for Computing Machinery
Dates: 14-16 September 1955
Place: Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Penna.
Subject: Annual General Meeting. Contact: Sidney Kaplan, R. C. A. Computing Systems Engineering, Building 13-2, Camden 2, New Jersey.

Fourth Annual Louisiana Polytechnic Institute Instruments Conference
Dates: 3-4 November 1955
Place: Ruston, Louisiana. Contact: School of Engineering, Louisiana Polytechnic Institute, Ruston, La.

Eastern Joint Computer Conference
Dates: 7-9 November 1955
Place: Hotel Statler, Boston, Mass.
Subject: "Computers in Business and Industrial Systems". Chairman of the program committee, Dr. I. Travis, Burroughs Corp., Paoli, Penna.

Second Computer Clinic
Dates: 15-17 November 1955
Place: Navy Pier, Chicago, Ill.
Feature: Six 2-hour demonstrations and lectures on various computers. Fee is $5.00. For registration: 2nd Automation Exposition, 845 Ridge Ave., Pittsburgh 12, Penna.

National Simulation Conference
Dates: 19-21 January 1956
Place: Dallas, Texas
It is expected that most of the papers will fall into the analog computer category, but papers on the use of digital computers in simulation will be strongly encouraged. Deadline for 100-word abstracts and 500-word summaries is September 10. Contact: J. R. Forester, 2104 Huntington, Arlington, Texas.

Western Joint Computer Conference
Dates: 8-10 February 1956
Place: San Francisco, Calif. Contact: Byron J. Bennett, chairman of the technical program committee, Stanford Research Institute, Stanford, California.

How's your technical library?

Check this list.

Nuclear Reactors for Industry and Universities, edited by Ernest H. Wakefield, 1954, cloth, 102 pages, 4-page index. Price $2.00 ☐

A Bibliographical Survey of Flow Through Orifices and Parallel-Throated Nozzles by T. H. Redding, 1952, cloth, 207 pages. Price $6.00 ☐

Process Control by A. J. Young, 1954, 140 pages, 3-page index. Price $2.00 ☐

Electronic Circuitry for Instruments and Equipment by Milton H. Aronson, 1953, cloth, 310 pages. Price $4.00 ☐

Scientific and Industrial Glass Blowing and Laboratory Techniques by W. E. Barr and Victor J. Anhorn, 1949, 4½" x 8", 388 pages. Price $6.00 ☐

The Electronic Control Handbook by R. R. Batcher & Wm. Moulic, 1952, paper, 244 pages. Price $3.00 ☐

Heat Inertia Problems of Automatic Control of Temperature by Victor Brodia, 1950, paper, 5¼" x 8¼", 61 pages. Price $1.00 ☐

Applications of Industrial pH Controls by Allen L. Chaplin, 1950, cloth, 4½" x 8", 144 pages. Price $2.50 ☐

Maintenance and Servicing of Electrical Instruments by James Spencer, Third Edition 1951, cloth, 4¾" x 8¼", 256 pages. Price $3.00 ☐

Mechanical Measurements by Electrical Methods by Howard C. Roberts, Second Edition 1951, cloth, 4¾" x 8¼", 537 pages. Price $4.00 ☐

Operation and Care of Circular-scale Instruments by James Spencer, 1949, cloth, 4½" x 8", 90 pages. Price $1.50 ☐

Instrumentation for the Process Industries (Sixth Symposium) 1952, paper, 8" x 11¼", 64 pages. Price $2.50 ☐

Instrumentation for the Process Industries (Fifth Symposium) 1951, paper, 8" x 11¼", 56 pages. Price $2.50 ☐

Guide to Foreign Sources of Metallurgical Literature by John T. Milek, 1951, paper, 8½" x 11", 108 pages. Price $2.50 ☐

A Romance in Research—The Life of C. F. Burgess by A. McQueen with Technical Appendix by O. W. Storey, 1951, cloth, 6" x 9", 430 pages. Price $6.00 ☐

Stress Corrosion of Mild Steel by James T. Waber & Hugh J. McDonald, 1947, paper, 5¾" x 8¾", vi+94 pages. Price $2.00 ☐

Instrumentation for the Iron & Steel Industry (Proceedings of Second Conference) 1953, paper 8" x 11¼". Price $2.00 ☐

Instrumentation for the Iron & Steel Industry (Proceedings of First Conference) 1951, paper, 8" x 11¼", 52 pages. Price $2.00 ☐

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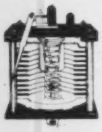
Briefs . . .

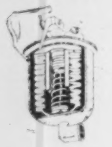
For this literature use postage-free order card on page 1163.

Liquid Level Control Handbook

The purpose of this bulletin is to survey various types of liquid level instrumentation currently available. A glance of comparison reveals how these systems range from the simple to the complex . . . from the old to the new . . . from the ball float using Archimedes' principle of buoyancy, to a product of the Atomic Age—a method employing gamma rays.

TABLE 5-1—PRESSURE GAGE MEASURING ELEMENTS AND RANGES





Element	Minimum Range	Maximum Range
Extra Large Spring and Bellows (Brass) (Back of Case)	0-5 in. water	0-90 in. water
Spring and Bellows (Brass) (Inside of Case)	0-90 in. water	0-16.3 psig
Spring and Bellows (Stainless Steel) (Inside of Case)	0-15 psig	0-40 psig
Spiral (Bronze)	0-18 psig	0-400 psig
Spiral (Steel)	0-30 psig	0-4,000 psig
Spiral (Stainless Steel)	0-50 psig	0-4,000 psig

Liquid level can be measured directly or inferred. The methods discussed include:

Direct Methods:

Cable and float
Conductivity electrode

Inferential Methods:

Pressure gage
Diaphragm box
Purge systems
Differential pressure converter
Mercury manometer
Non-indicating pressure controller
Displacement transmitter
Strain gage
Gamma ray detector

(*From* 24-*page Bulletin* 1161, *Minneapolis-Honeywell Regulator Co., Ind. Div., Phila.* 44, *Penna.*)

For this literature circle **401** on inquiry card.

Dewcel

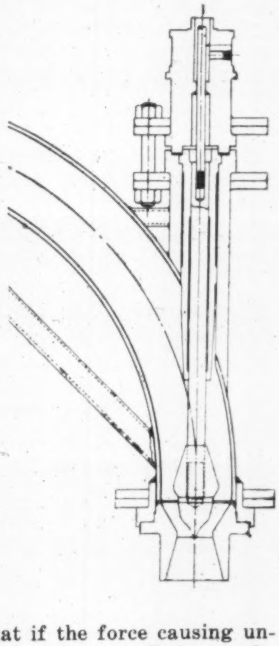
Dew point is commonly defined as the temperature at which moisture will condense out of the air. Dew point is also defined as the saturation temperature corresponding to the partial pressure of water vapor. The Dewcel measures water vapor pressure through a unique temperature system. This measurement is converted by the instrument to record *dew point temperatures, grains of moisture per pound of dry air, grains of moisture per standard cubic foot, or percentage of water by volume.*

The basis of operation of the Dewcel is the behavior of a hygroscopic salt in the presence of water vapor. If dry lithium chloride is exposed to the atmosphere under average room conditions, it will absorb moisture and dissolve, forming a saturated solution. If the salt and saturated solution is heated to higher temperatures, the water in the solution tends to escape to the atmosphere until a temperature is reached where the escaping tendency of the water is equal to the tendency of the salt to take on water from the atmosphere. In other words, the vapor pressure exerted by the water in the solution is equal to the partial pressure of the water vapor in the atmosphere and an equilibrium condition exists. At this equilibrium point, the temperature of the salt and the saturated solution (temperature of the Dewcel) is a measure of the partial pressure of water vapor in the surrounding atmosphere, i.e., dew point temperature. Besides operating in normal atmospheres, the Dewcel operates properly in natural gas, carbon dioxide, nitrogen, hydrogen, and oxygen.

The humidity sensitive Dewcel consists essentially of a thermometer bulb inside a thin-walled metal tube covered with a woven glass tape impregnated with lithium chloride. The tube is wound with a pair of silver or gold wires over the tape and covered with a perforated metal guard. When the lithium chloride salt absorbs moisture from the surrounding atmosphere, it becomes an electrical conductor so that current passes between the two wires thereby raising the temperature of the Dewcel until equilibrium is attained. This equilibrium temperature is measured with a conventional temperature bulb, either liquid expansion or electrical resistance thermometer type. The entire operation is simple, positive and completely automatic . . . may be used to measure dew point temperatures between −150 F and +142 F. (*From* 8-*page Bulletin* 407-1, *The Foxboro Co., Foxboro, Mass.*)

For this literature circle **402** on inquiry card.

Holo Plug, Long-sweep Angle Valve



For fluids of extremely high viscosity or with an appreciable percentage of slurry, the long sweep angle valve provides the ultimate in streamlined flow . . . . provides minimum flow resistance, and there is as little possibility of material sticking in the valve as there is in the line itself. It is ideal for extremely viscous substances, where the flow must be absolutely smooth in order to prevent a change in the physical nature of the fluid.

The Venturi throat design insures maximum efficiency of flow. Fluid cannot separate from the body to form eddying wakes . . . . friction is reduced . . . . energy is conserved.

It has long been conceded that if the force causing unbalance in single seat valves could be cancelled out, the

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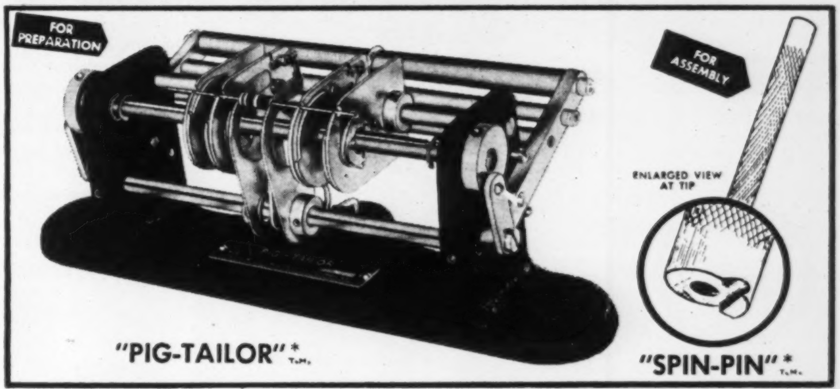

The "PIG-TAILOR" plus "SPIN-PIN" — Accurately Measures, Cuts, Bends, Ejects and Assembles both leads simultaneously to individual lengths and shapes — 3 minute set-up — No accessories — Foot operated — 1 hour training time.

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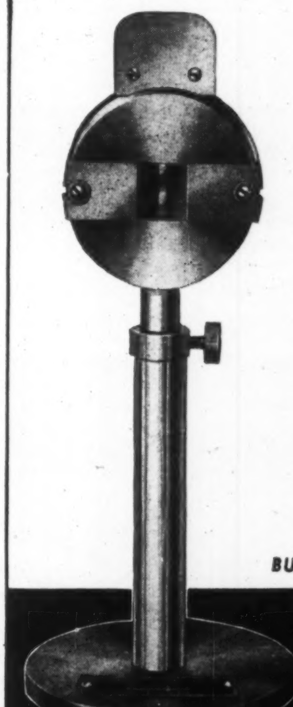

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**Vandaveer, Industrial & Engineering Chemistry, Vol. 22, page 596, June 1930.*

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BRIEFS—CONTINUED

amount of pressure that such valves could handle would be greatly increased, and the superstructure design simplified. Boring a hole along the axis of the plug seemed to be one of the logical answers. Outlet pressure could thereby be transmitted to the top of the plug where its downward thrust would equal the upward force exerted on the bottom of the plug . . . The principle was sound; the problem lay in making the design workable . . . The Holo Plug is the first of such designs to achieve complete balance in simple and efficient control valves. (*From new 6-page Bulletin 104-B, Hammel-Dahl Co., 175 Post Rd., Providence 5, R. I.*

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door exposure). (*From new 64-page manual A-8165, E. I. Du Pont De Nemours and Co., Inc., Polychemicals, Dept., Wilmington 98, Del.*)

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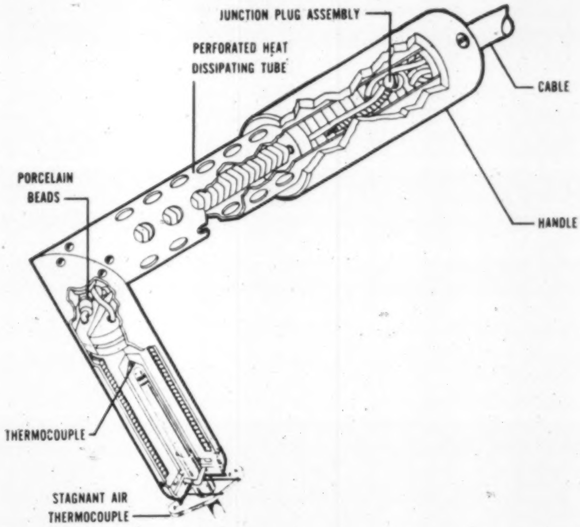

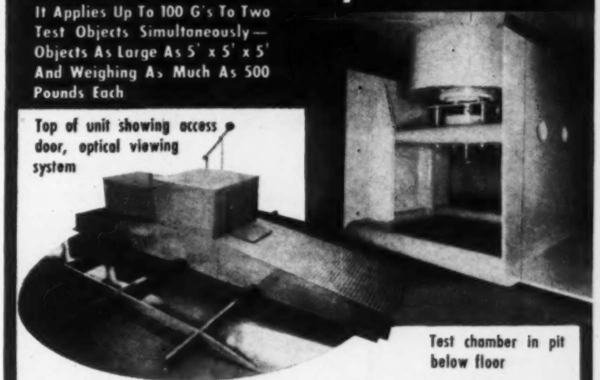
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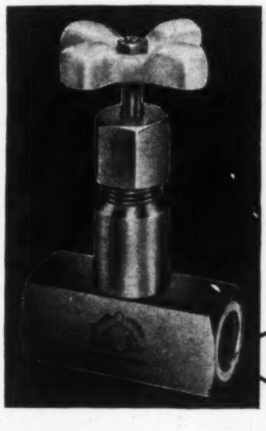
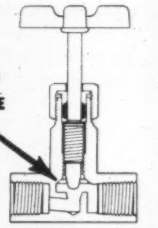

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For this literature circle **405** on inquiry card.

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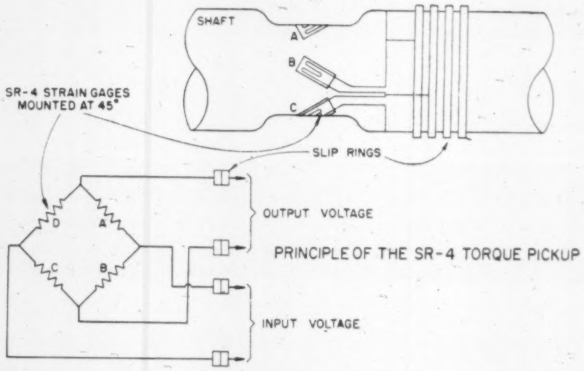
The Standard Baldwin SR-4 Torque Pickup is essentially a short length of shaft which, when loaded in torsion, translates that torsion into changes in electrical



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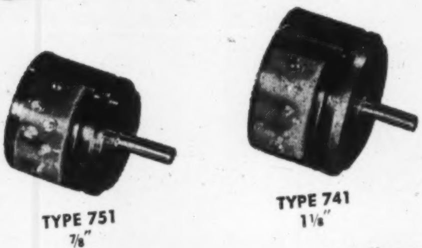

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energy. Thus, when coupled into a line of shafting, the pickup will measure the torque being transmitted by that shaft while in no way influencing or changing its magnitude. This measurement is also independent of speed.

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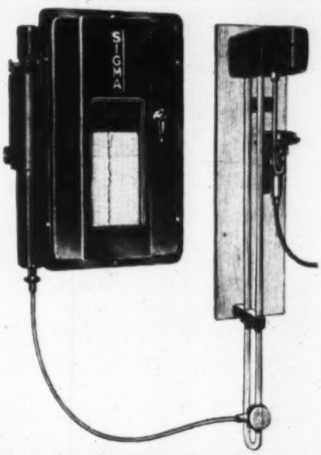

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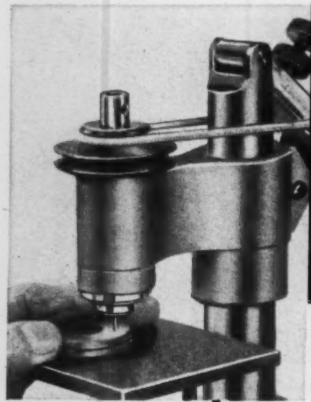

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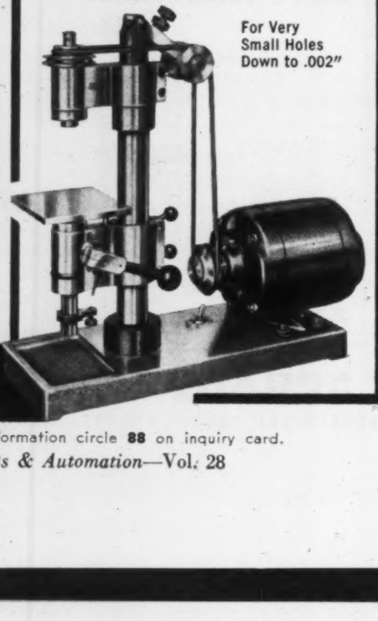

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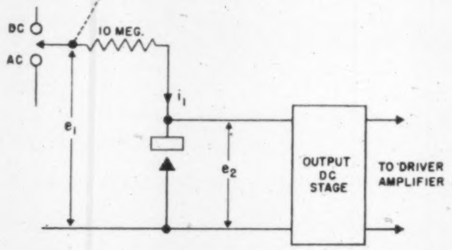

and e_1 over the range from 200 to .6 volts for e_1. This is a 50 db spread, and the DC output amplifier which accepts the diode voltage e_2 is arranged to have a gain which results in a stylus deflection of 50 millimeters on the recorder chart in response to this 50 db variation in the value of e_1.

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For this literature circle **407** on inquiry card.

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in 1954 of its vacuum melting business. Furnaces ranging from 10 to 1000 pounds will be in operation.

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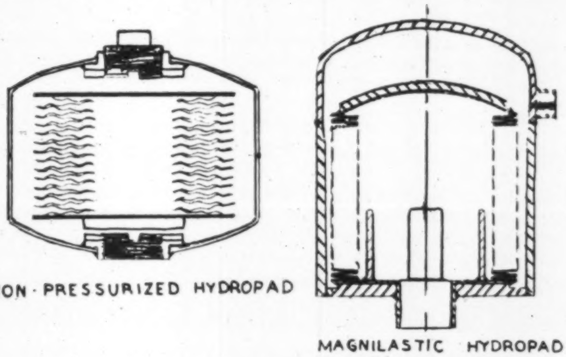
For this literature circle **408** on inquiry card.

Hydraulic Surge

This manual has been prepared for the engineer who seeks explanations for surge phenomena, universally applicable formulas expressed in common engineering units, and methods of surge analysis formulated for rapid use. Several plots and nomographs have been prepared for water hammer and surge control problems. Included are data to permit complete surge analysis of most piping systems. . . . This manual covers the fields of water ham-



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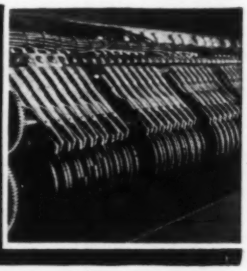

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RANGES AVAILABLE

Temperature Range	One Rotation of Chart
–30° to +120°F	7 Days
–30° to +120°F	24 Hours
–20° to + 40°F	24 Hours
–10° to + 50°F	7 Days
–10° to + 50°F	24 Hours
30° to 60°F	24 Hours
40° to 100°F	7 Days
40° to 100°F	24 Hours
60° to 90°F	24 Hours
60° to 90°F	8 Hours
70° to 130°F	24 Hours
70° to 130°F	8 Hours
100° to 160°F	4 Hours
–25° to + 10°C	24 Hours
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The TEMPSCRIBE self-registering Recording Thermometer meets a long-felt need for a moderately priced recorder for general purpose applications where a graphic record of temperature in surrounding air is required. The record—written on an easy-to-read chart, 4" in diameter, with graduations spaced uniformly over full range—is indispensable wherever knowledge is desired if temperature goes above or below any given point. TEMPSCRIBE is the only recorder made with pen and actuating element in door, which, when opened, permits a clear view of the complete chart, and easy chart replacement without danger of damaging pen arm or accidentally marking chart.

Write for Bulletin 704

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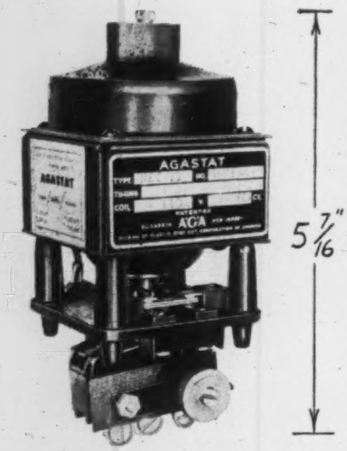
For more information circle **92** on inquiry card.



Staggered starting of electric motors...

AGASTAT

Time / Delay / Relay

AGASTAT allows you to stagger the starting of three motors without imposing their load on the line at the same time.

The AGASTAT is
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Pioneers in pneumatic timing.

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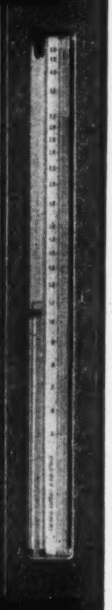
NEW! TYPE II VISCOMETER



The Type II Viscometer has been developed to provide, *in a matter of minutes*, accurate, direct readings of kinematic viscosity of fuels, light oils, and non-corrosive liquids. The Type II uses a proven method based on advanced flow design. *No other laboratory instruments are required. Time-consuming equipment set-ups are avoided. No special operating skill is needed.*

Readability of the Type II is within 1% of indicated viscosity at any point on the scale. Its range of .5 to 5.0 centistokes includes *all* liquids used in testing aircraft fuel system components—making it ideal for use in the laboratory or field, or on new or existing test equipment!

Comes completely equipped as panel-mounted or portable. Widest possible range. Outstanding readability Extremely simple to operate — no special skill needed.

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For more information circle **94** on inquiry card.

mer, surge-suppressing devices, surge control with pneumatic suppressors, pulsation control and resonance, accumulators, and thermal expansion compensation.

The A.S.M.E. Committee on water hammer defined five basic conditions for water hammer analysis: Case I—Conduits of uniform thickness and diameter; Case II—Conduits of variable thickness and diameter; Case III—Conduits having branch pipes; Case IV—Water hammer in pump discharge conduits (power failure of centrifugal pump in uphill pumping station); Case V—Surge tanks (stand pipes open to atmosphere). To these may be added Case VI—Pulsation in reciprocating pump discharge lines; Case VII—Surge Control by relief and bypass-type suppressors; Case VIII—Surge control by pneumatic surge suppressors (*From new 70-page booklet "Analysis & Control of Hydraulic Surge," by Howard Moore, Cook Electric Co., 2700 Southport Ave., Chicago 14, Ill.*)

For more information circle **409** on inquiry card.

Vibra-flow Controllers

Vibrating Feeders provide an efficient and economical method of feeding bulk material and, what is more important, the simplest and easiest means of controlling its rate of flow or feed.

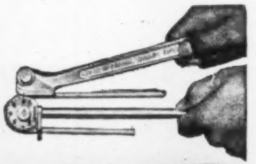
A trough, mounted on flexible leaf springs, is vibrated at a high speed by an electromagnet.

The magnet, energized by pulsating current, pulls the trough sharply down and back—then the leaf springs return it up and forward to its original position—although not so sharply as the down-pull.

The material in the trough falls perpendicularly, as the trough is pulled sharply backwards out from under it, to a new position forward in the trough pan—then as the leaf springs return it up and forward, the material is carried with it—to have the same action repeated—at high speed.

This trough action makes the material appear to flow like water.

NEW IMPERIAL *BLUE DOT* TUBE BENDERS



Bend hard or soft tubing. Form neat accurate bends to short radius. Calibrated. *No. 364-FH* individual benders for each size of tubing 3/16" to 3/4" O.D. Also many other models.

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All types, for making 45°, 37° and double flares...on copper, aluminum, steel and stainless steel tubing No. 500-F Flaring Tool illustrated, makes 45° flares and then burnishes them.

IMPERIAL HI-DUTY TUBE CUTTER
Free wheeling ball bearing action. Roller type with flare cut-off groove. Retractable reamer. *No. 274-F* for 1/8" to 1" tubing. Other models. Also sawing vises.

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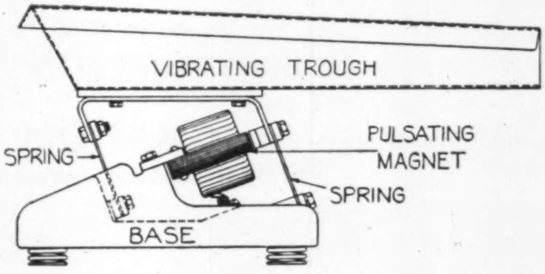
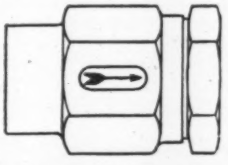


The rate of feed is controlled by a rheostat or dial switch in the controller and, in the small feeders (from the F-00 to the F-11) can be varied through settings from a rushing troughful down to a trickling dribble. (*From new* 146-*page Catalog* 555, *covering batching equipment, electric heating elements, selenium rectifiers, etc., Syntron, Homer City, Penna.*)

For this literature circle **410** on inquiry card.

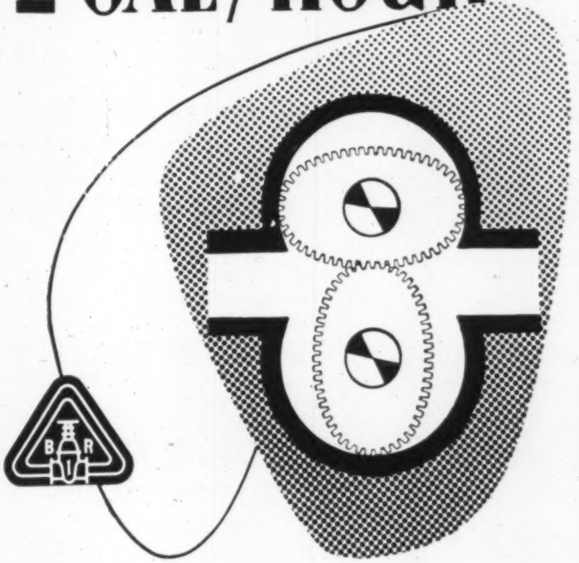
Mesurflo Control



The "Mesurflo" Control is an entirely new concept of how to control and maintain one set rate of fluid flow regardless of variable inlet pressures. It is not just another flow retarding or pressure reducing device, but a true and accurate means of discharging a specific flow rate . . . The control harnesses the pressure and puts it to work to control itself in this simple manner. Pressure flexes the rubber diaphragm into the machined grooves and hole of the brass orifice plate, one fixed rate of outlet flow is assured as the flow is regulated in direct proportion to the inlet pressures exerted against the diaphragm . . . has only one moving part, only four components. (*From new* 8-*page brochure* 231, *Hays Mfg. Co., Erie, Pa.*)

For this literature circle **411** on inquiry card.

HOW TO MEASURE
2 GAL/HOUR



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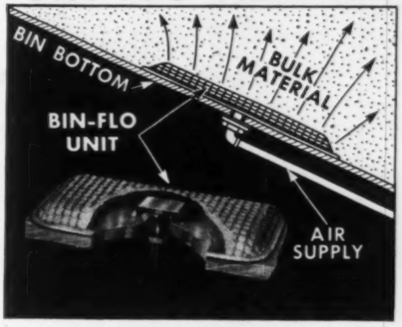

Provides Steady Flow of Dry, Finely Ground Materials which tend to bridge in storage. Uses only small amount low-pressure air.

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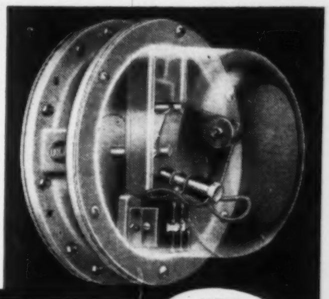
For All Bulk Materials

signals change in level; automatically starts and stops filling and emptying equipment.



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New Literature...

INSTRUMENTS and AUTOMATION

For literature use the postage-free order card on page 1163.

AUTOMATION

Process Instrumentation. New 48-page issue of "Instrumentation" (Vol. 8, No. 1) features article on applications of maker's process control instruments in reactor control, power frequency control, textile weave control, lens manufacture, etc.—Minneapolis-Honeywell Reg. Co., Ind. Div., Phila. 44, Pa.
Circle **412** on inquiry card.

Process Instrumentation. New 2-page Bulletin F 5608-1 describes maker's indicating and recording instrument for control and measurement, indicating and recording, for industrial processing, laboratories and generating stations.—Barber-Colman Co., Wheelco Instruments Div., Rockford, Ill.
Circle **413** on inquiry card.

Position Sensing Controller. New 4-page descriptive booklet illustrates maker's new "Proximitrol" electronically operated sensing and triggering device for pickup of basic intelligence use in control of industrial or process operations.—Paul Morrow Co., Inc., P. O. Box 1701, Wilmington, Delaware.
Circle **414** on inquiry card.

Combustion Control. New 12-page Bulletin CC-31 describes maker's "Fireye" integrated control system including controls, timers, relays, valves and accessories for safe startup and operation of multiple-burner boilers.—Combustion Control Div., Electronics Corp. of America, 718 Beacon St., Boston 15, Mass.
Circle **415** on inquiry card.

Remote Control Signaling. New 6-page brochure describes operating features and performance of maker's tone equipment for transmitting and receiving signaling, dialing, telemetering, supervisory controls, etc.—Hammarlund Mfg. Co., Inc., 460 W. 34th St., New York 1, N. Y.
Circle **416** on inquiry card.

Combustion Control. New 4-page issue of "Wheelco Comments" (No. 3, Vol. 15) describes and illustrates maker's "Flame-otrol" combustion controllers in use with direct-fired textile equipment.—Barber-Colman Co. Rockford, Ill.
Circle **417** on inquiry card.

Servo System. New technical Bulletin F-4331-1 describes maker's velocity-feedback servo system for high-speed remote control of aircraft throttles, jet afterburner valves, test cell apparatus, etc.—Barber-Colman Co., 1400 Rock St., Rockford, Ill.
Circle **418** on inquiry card.

Water Plant Control. New 16-page reprint on "Instrumentation and Control for Water Filtration Plants" contains photos and diagrams of maker's line of instrumentation equipment for control of water treatment plants.—Builders-Providence, Inc., 348 Harris Ave., Providence, R. I.
Circle **419** on inquiry card.

Autosizing Grinder Control. New 4-page brochure describes maker's "Electro-Autosizing" process of automatic control of size during a work cycle by making the size of workpiece itself control or stop process.—Electro-Autosizing Machine Div., Industrial Gauges Corp., W. Englewood, N. J.
Circle **420** on inquiry card.

Industrial Count-control Instruments. New 4-page bulletin pictures and describes maker's counters and control instruments for counting, computation, programming, etc.—Atomic Instrument Co., 84 Massachusetts Ave., Cambridge 39, Mass.
Circle **421** on inquiry card.

Flame Control. New 4-page illustrated Bulletin 660 describes maker's "Twin Flame" controls for gas-fired industrial equipment.—Control Engineering Corp., 934 Washington St., Norwood, Mass.
Circle **422** on inquiry card.

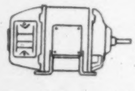
Photoelectric Controls. New 20-page illustrated bulletin "Proved Answers to Successful Automation" presents specifications on maker's photoelectric controls for high-speed counting, inspection, sorting, smoke control, etc.—Electronics Corp. of America, 77 Broadway, Cambridge 42, Mass.
Circle **423** on inquiry card.

Process Monitor. New 4-page bulletin describes maker's "Safalarm" packaged automatic protection for electrical circuits and equipment, which monitors process variables, temperatures, etc.—Stone Boiler Equipment Corp., 186 Powers St., Brooklyn 11, N. Y.
Circle **424** on inquiry card.

Machine Control. New 4-page Bulletin 55-1 describes maker's electrical control system for predetermined repeat or non-repeat cycle on machines with a mechanical tripping mechanism.—Security Controls, Inc., 255 Franklin St., Buffalo 2, N. Y.
Circle **425** on inquiry card.

Office Automation. New 20-page booklet "Methods, Manpower and Machines" explains how it is possible for small or large business to use automatic data-handling techniques.—Statistical Tabulating Co., 53 W. Jackson Blvd., Chicago 4, Ill.
Circle **426** on inquiry card.

MOTORS, CLUTCHES



Dynamotors, Receivers. New 16-page issue of "This Month" presents list of maker's actuators, analyzers, compasses, blowers, calibrators, indicators, dynamotors, gauges, motors, recorders, switches, timers, etc.—Herbach & Rademan, Inc., 1204 Arch St., Phila. 7, Pa.
Circle **427** on inquiry card.

Motors. New 4-page Bulletin G1 describes maker's "Type DYAZ Barcol" double-plate geared motors for overhanging or radial thrust loads.—Barber-Colman Co., Rockford, Ill.
Circle **428** on inquiry card.

Motors. New 4-page issue of "Bodine Motorgram" (Vol. 35, No. 3) describes maker's "Type NSH-11R" motor used in desk top copying machine.—Bodine Electric Co., 2282 W. Ohio St., Chicago, Ill.
Circle **429** on inquiry card.

Magnetic Clutches. New 4-page descriptive bulletin presents specifications of maker's magnetic clutches and drives.—Electronic Manufacturing Engineers Co., 2410 Beacon Ave., Seattle 44, Wash.
Circle **430** on inquiry card.

Induction Motor. New 2-page bulletin describes maker's "Type AC-93" miniature sub-fractional 400-cps induction motor for application to tape recording, geophysical exploration or to servo- or actuator-motor requirements.—Dalmotor Co., 1343 Clay St., Santa Clara, Calif.
Circle **431** on inquiry card.

Hydraulic Transmission. New 4-page Catalog T-100 describes maker's variable-speed hydraulic transmission used on agitators, beaters, hoists, machine tools, power saws, etc.—Gerotor May Corp., Maryland Ave. and Oliver St., Baltimore 3, Md.
Circle **432** on inquiry card.

Synchronous Brake. New 4-page bulletin pictures and describes maker's synchronous brake for governing speed of rotating device.—Allard Instrument Corp., 30 Broad St., New York 4, N. Y.
Circle **433** on inquiry card.

VALVES

Valves, Hydraulic Components. New 34-page Bulletin 155 describes and illustrates maker's standard line of selector, restrictor, sequence, check and shut-off valves.—Aircraft Products Co., 300 Church Rd., Bridgeport, Pa.
Circle **434** on inquiry card.

Valves, Filters, Driers. New 20-page Catalog W-3-S illustrates and describes maker's line of refrigeration valves, filters and driers.—A-P Controls Corp., 2450 N. 32nd St., Milwaukee, Wis.
Circle **435** on inquiry card.

Valves. New 4-page Bulletin 2000 describes and illustrates maker's "Model 2000" dry-solenoid servo valves for high-performance electro-hydraulic positional-type servo systems.—Moog Valve Co., Inc., East Aurora, N. Y.
Circle **436** on inquiry card.

Solenoid Valves. New 2-page Bulletin 743 describes maker's low-pressure gas solenoid valve for handling air, gas, propane, butane, water, gasoline, light fuel oil, etc.—Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.

Circle **437** on inquiry card.

Solenoid Valves. New 2-page Bulletin 803A describes maker's low-pressure gas solenoid valve for low-pressure service of air, gas, and other fluids to 180 F.—Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.

Circle **438** on inquiry card.

Solenoid Valves. New 6-page Bulletin RS141 describes maker's line of solenoid valves used with liquids, gases or refrigerants for stop and start operations, metering or measuring, etc.—A-P Controls Corp., 2450 North 32nd St., Milwaukee, Wis.

Circle **439** on inquiry card.

Shut-Off Valve. New 2-page bulletin describes and illustrates maker's "Series 1245" packless "Hi-Vac" pressure shut-off valve.—Associated Valve & Engineering Co., 1150 W. Marquette Road, Chicago 21, Ill.

Circle **440** on inquiry card.

Valves, Relays. New 2-page Bulletin 359 pictures and describes maker's pneumatic relays and pilot valves, pressure-electric switches and electric pneumatic valves.—Powers Regulator Co., Skokie, Ill.

Circle **441** on inquiry card.

Valves, Seals, Gaskets. New 2-page Bulletin VG-2 pictures and describes maker's high-vacuum valves, seals, and gaskets.—Vacuum Research Co., 420 Market St., San Francisco 11, Calif.

Circle **442** on inquiry card.

Reset Valves. New 4-page Bulletin CV-31 describes maker's "Series 81G" manual reset safety shutoff valves used to automatically shut off flow of fuel to an oil or gas burner in event of flame failure or interlocks in burner control circuit.—Combustion Control Div., Electronics Corp. of America, 718 Beacon St., Boston 15, Mass.

Circle **443** on inquiry card.

Valves. New 4-page Bulletin 650-L1A describes and illustrates maker's "Model BV" tight-closing rubber-seated butterfly valves.—Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I.

Circle **444** on inquiry card.

Valves. New 2-page bulletin pictures and describes maker's solenoid, hand and pilot valves.—A. K. Allen Co., 57 Meserole Ave., Brooklyn 22, N. Y.

Circle **445** on inquiry card.

Check Valve. New 4-page bulletin describes and illustrates maker's "Technocheck" silent, seatless check valve for gas, air and other fluid lines.—Techno Corp., 16-30 W. 5th St., Erie, Pa.

Circle **446** on inquiry card.

POSITIONERS, ACTUATORS

Cylinders, Actuators. New 8-page Bulletin IC-2.3 describes maker's power drive cylinder for fluid power transmission. Bulletin I.C.-2.2 details maker's line of pneumatic hydraulic actuators and controls for industrial production machinery.—National

THERMOSTATIC
DELAY RELAYS

Provide delays ranging from 2 to 150 SECONDS

MOST COMPACT
MOST ECONOMICAL
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- *Hermetically sealed.* Not affected by altitude, moisture, or other climate changes.
- Circuits: *SPST only*—normally open or normally closed.

Amperite Thermostatic Delay Relays are compensated for ambient temperature changes from —55° to + 70°C. Heaters consume approximately 2 W. and may be operated continuously.

The units are *most compact, rugged, explosion-proof, long-lived,* and — *inexpensive! TYPES:* Standard Radio Octal, and 9-Pin Miniature.

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Also—a new line of **Amperite Differential Relays** — may be used for *automatic overload, over-voltage, under-voltage* or *under-current protection.*

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- Amperite Regulators are designed to keep the current in a circuit ***automatically regulated*** at a definite value (for example, 0.5 amp).
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- Hermetically sealed, light, compact, and most inexpensive.

Amperite Regulators are the simplest, most effective method for obtaining ***automatic regulation*** of current or voltage. ***Hermetically sealed,*** they are not affected by changes in altitude, ambient temperature (—55° to +90°C), or humidity. Rugged; no moving parts; changed as easily as a radio tube.

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Write for 4-page Technical Bulletin No. AB-51

For more information circle **99** on inquiry card.

NEW LITERATURE

Pneumatic Co., Inc. and Holtzer-Cabot Divisions, 125 Armory St., Boston, Mass.

Circle **447** on inquiry card.

Hydraulic Cylinders. New 4-page catalog presents maker's line of air and hydraulic cylinders, valves and packaged units.—Modernair Corp., 400 Preda St., San Leandro, Calif.

Circle **448** on inquiry card.

Pneumatic Positioning Equipment. New 4-page illustrated bulletin presents maker's complete line of miniature pneumatic equipment used in light production positions or new products.—Clippard Instrument Laboratory, Inc., 7390 Colerain Rd., Cincinnati 23, Ohio.

Circle **449** on inquiry card.

Iron Hands. New 8-page Catalog 10 presents operating instructions and parts lists for maker's "iron hands" pneumatically operated jaws and arms. —Sahlin Engineering Co., 267 Ferndale St., Birmingham, Mich.

Circle **450** on inquiry card.

TEMPERATURE

Pyrometer Supplies. New 16-page catalog pictures and describes maker's pyrometer supplies, thermocouples, components, etc.—Arklay S. Richards Co., Inc., 76 Winchester St., Newton Highlands 61, Mass.

Circle **451** on inquiry card.

Scientific Enclosures Quickly Assembled!

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The Widney-Dorlec Cabinet System, consisting of a series of pre-fabricated, dural die-cast corners, extruded dural sections and other special components, now makes it possible to build modern, fully-radiused cabinets to any set of dimensions without special tools!

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BRITISH INDUSTRIES CORPORATION
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For more information circle **100** on inquiry card.

Millivolt Indicators. New 4-page Data Sheet E-33 (1) describes maker's portable millivolt indicators for temperature and calibration studies involving low-voltage measurements.—Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.

Circle **452** on inquiry card.

Temperature Bridges. New Data Sheet E-332 describes maker's d-c temperature bridges for temperature and temperature-difference measurements by resistance-thermometer method.—Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.

Circle **453** on inquiry card.

Thermocouple Wires. New 4-page Bulletin 31-300 pictures and describes maker's "Ceramo" thermocouple wires and thermocouple extension wires.—Thermo Electric Co., Inc., Saddle River Township, Rochelle Park Post Office, N. J.

Circle **454** on inquiry card.

Potentiometer. New 2-page Bulletin F-5760-1 describes maker's portable potentiometer for checking installations of temperature measurement and control instruments.—Barber-Colman Co., Wheelco Instruments Div., Rockford, Ill.

Circle **455** on inquiry card.

Thermistor Heat Detectors. New 4-page illustrated Brochure TDS-HDC describes maker's "Servotherm" thermistor heat detector cells used in far-infrared heat detection, measurement, or control.—Servo Corp. of America, 2020 Jericho Turnpike, New Hyde Park, N. Y.

Circle **456** on inquiry card.

Temperature Measurement. New 8-page brochure presents article on basic techniques of "How Temperatures are Measured."—Tempil Corp., 132 W. 22nd St., New York 11, N. Y.

Circle **457** on inquiry card.

Sim-Ply-Trol Pyrometers. New 12-page descriptive bulletin G-7 illustrates maker's "Sim-Ply-Trol and Versatrol" automatic controllers for heat, speed, radiation, voltage, current, pH, etc.—Assembly Products, Inc., Chesterland, Ohio.

Circle **458** on inquiry card.

Thermometers. New 2-page bulletin describes maker's line of temperature indicators and recorders, including mercury-filled systems, bimetal types, stem type, etc.—Moeller Instrument Co., 132 St. & 89 Ave., Richmond Hill, N. Y.

Circle **459** on inquiry card.

Heating Tapes. New bulletin describes maker's Electrothermal heating tapes which can be wound around laboratory glassware or metallic industrial equipment.—Arthur S. LaPine & Co., 6001 S. Knox Ave., Chicago 29, Ill.

Circle **460** on inquiry card.

Temperature Measurement. New 2-page Bulletin A-88 describes and illustrates maker's thermocouple-operated "Model 388 Therm-O-Meter" for measuring temperatures from −50 to +1000 F.—Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.

Circle **461** on inquiry card.

Answers to I.Q. Quiz on page 1102

1.—c	5.—a	9.—b
2.—b	6.—b	10.—c
3.—a	7.—b	11.—c
4.—b	8.—d	12.—b

Pyrometers, TC Switches. New 2-page Bulletin IN-1 describes and illustrates maker's high-resistance indicating pyrometers and thermocouple switches.—West Instrument Corp., 525 N. Noble St., Chicago 22, Ill.

Circle **462** on inquiry card.

Temperature Control. New 2-page Bulletin 151 describes maker's "Models HA and DA" pneumatic-control differential-expansion temperature controllers for operating diaphragm valves or motors.—Burling Instrument Co., Inc., 16 River Rd., Chatham, N. J.

Circle **463** on inquiry card.

Thermometer. New 4-page leaflet describes maker's "T-100" surgical thermometer for meeting requirements of surgical use—Medical Instrument Research Associates, 2656 N. Pasadena Ave., Los Angeles 31, Calif.

Circle **464** on inquiry card.

Cooling Control. New 2-page Supplement 1 describes maker's "T44" cooling control which holds temperature of cooling water in jackets or coils of equipment such as compressors, oil coolers, etc.—Sarco Co., Inc., Empire State Bldg., New York 1, N. Y.

Circle **465** on inquiry card.

Temperature Indicating System. New 2-page Bulletin 11 describes maker's critical-temperature indicating system for industrial, airborne, and laboratory use.—Sherberne & Associates, 3040 Overland Ave., Los Angeles 34, Calif.

Circle **466** on inquiry card.

PRESSURE, WEIGHT

Pressure Measurement. New 4-page bulletin presents maker's "Dynagage DG-400", electronic instrument for measuring static and dynamic pressures from 1 psi to 75,000 psi.—Photocon Research Products, 421 N. Foothill Blvd., Pasadena 8, Calif.

Circle **467** on inquiry card.

Micromanometer. New 2-page bulletin describes and illustrates maker's "Model MM-2" micromanometer for measuring small pressure differences with accuracy of ±0.0002" over 2" operating range.—Flow Corp., 283 Concord Ave., Cambridge 38, Mass.

Circle **468** on inquiry card.

Altimeters. New 8-page descriptive booklet presents specifications on maker's "Micro" and "Terra" light weight surveying altimeters.—American Paulin System, 1524 S. Flower St., Los Angeles 15, Calif.

Circle **469** on inquiry card.

High-pressure Equipment. New 4-page Bulletin 1254 describes maker's "Dispersimax" method of promoting chemical reactions between gases, liquids and solids in high-pressure autoclaves.—Autoclave Engineers, Inc., 860 E. 19th St., Erie, Pa.

Circle **470** on inquiry card.

Belt Weighing. New 4-page illustrated bulletin describes maker's "Belt-meter" for electrical weighing of solids on conveyors.—Trans-Weigh Co., Wayne, Pa.

Circle **471** on inquiry card.

FLOW

Flow Control. New 24-page Catalog 2 presents specifications of maker's process control instruments including all-glass flow meters, pressure regulators, chemical feeders, specific gravity testers, etc.—Fischer & Porter Co., 397 Jacksonville Rd., Hatboro, Pa.

Circle **472** on inquiry card.

Rotameters. New 8-page Bulletin 130 pictures maker's armored rotameters for high-pressure and high-temperature fluid-flow-rate measurement and control.—Brooks Rotameter Co., Lansdale, Pa.

Circle **473** on inquiry card.

Pneumatic Transmitter. New 4-page Bulletin 285-L2A presents description on maker's "Model AT-SD BalanCel" pneumatic transmitter for flow-rate and level use.—Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I.

Circle **474** on inquiry card.

Proportioning Pump. New 2-page Bulletin 1201-2 describes maker's heavy-duty midget "Chlor-O-Feeder" proportioning pump for chlorination of water and sewage.—Proportioneers, Inc., Div. of B-I-F Industries, Inc., Providence 1, R. I.

Circle **475** on inquiry card.

Flowmeter Calibration. New 4-page bulletin describes maker's flowmeters and flowmeter calibration equipment for calibrating liquid flowmeters and standards by using measured weight of fluid and precision timers.—Bone Engineering Corp., 701 W. Broadway, Glendale 4, Calif.

Circle **476** on inquiry card.

Flow Switch. New 12-page Technical Bulletin 260 describes maker's "Shur-Flo" automatic interlock providing automatic protection whenever rate of flow is above or below an unsafe rating.—Hays Mfg. Co., West 12 St., Erie, Pa.

Circle **477** on inquiry card.

RECORDING

X-Y Recorders. New 4-page descriptive bulletin illustrates maker's "Model 2 Autograf" X-Y recorder for cartesian-coordinate curve drawing, point plotting and readout.—F. L. Moseley Co., 409 N. Fair Oaks Ave., Pasadena 3, Calif.

Circle **478** on inquiry card.

X_1-X_2 Recording. New 2-page illustrated Data Sheet E-ND46(3) describes maker's Speedomax X_1-X_2 recorder for measurement of stress and strain, temperature and pH, width and thickness of strip in rolling mills, and any two functions vs. time.—Leeds & Northrup Co., 4934 Stenton Ave., Phila. 44, Pa.

Circle **479** on inquiry card.

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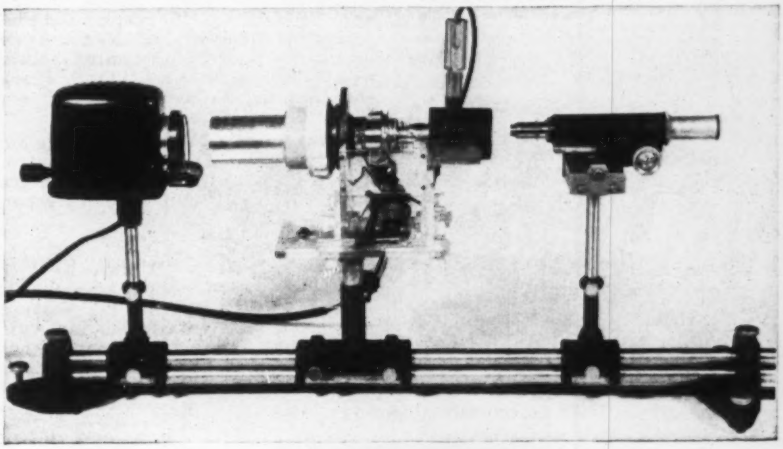

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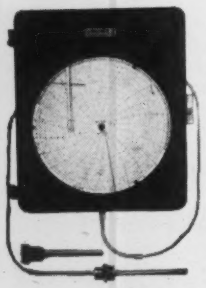

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NEW LITERATURE

Recording Oscillograph. New 4-page Bulletin MI-2-55-590 describes and illustrates maker's "Model 590" oscillograph which includes a remotely-controlled jump-speed system.—Midwestern Instruments, P. O. Box 7186, Tulsa, Okla.
Circle **480** on inquiry card.

Oscillograph. New 12-page issue of "Hathaway Engineering News" (Vol. 5, No. 1) describes evolution of maker's "S14-E" oscillograph and has article on "Theory and Measurement of Symmetrical Components."—Hathaway Instrument Co., 1315 S. Clarkson, Denver, Colo.
Circle **481** on inquiry card.

Recording Charts. New 14-page bulletin outlines methods and controls used in producing recording instrument charts.—Bristol Co., Waterbury 20, Conn.
Circle **482** on inquiry card.

Automatic Data Display. New 16-page issue of "General Radio Experimenter" (Vol. 29, No. 11) features article on "A New System for Automatic Data Display."—General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass.
Circle **483** on inquiry card.

Data Printers. Two new 6-page folders describes maker's numerical data printers for business, industry and laboratory; lists six models of parallel entry and four models of serial entry printers.—Clary Corp., Electronic Div., San Gabriel, Calif.
Circle **484** on inquiry card.

Magnetic Recorders. New 8-page bulletin is reprint of article on state of magnetic-recording art.—Ampex Corp., 405 Lexington Ave., New York 17, N. Y.
Circle **485** on inquiry card.

Magnetic Recording System. New 4-page Bulletin S-307 (P) describes maker's "magneDISC" recording system for producing a permanent record of seismic information on 96-channel 18-inch-diam. disc.—Houston Technical Labs., 2424 Branard, Houston 6, Tex.
Circle **486** on inquiry card.

High-speed Data Printing. New 8-page Bulletin DR-255-2.5 describes and illustrates maker's synchroprinters for recording output of digital computers, electronic business machines, data reduction systems, etc.—ANelex Corp., Concord, N. H.
Circle **487** on inquiry card.

Copying Machine. New 4-page bulletin describes and illustrates maker's "Copease Duplex" for producing dry, positive copies of an original up to 14" in width and any length.—Copease Corp., 270 Park Ave., New York 17, N. Y.
Circle **488** on inquiry card.

RADIOACTIVITY

Nuclear Reactor Equipment. New 4-page Bulletin GEA-6014 pictures maker's research reactor systems, remote handling equipment, and electromagnetic pump and coolant system components.—General Electric Company, Schenectady 5, N. Y.
Circle **489** on inquiry card.

Surveying Instruments. New 8-page bulletin describes and illustrates maker's scintillation survey instruments for seeking oil and uranium.—The Radiac Co., Inc., 489 Fifth Ave., N. Y. 17, N. Y.
Circle **490** on inquiry card.

Scaler, Ratemeter. New Bulletin 10M-155 describes maker's combined scaler and ratemer for counting pulses and measuring instantaneous value or rate of change of pulse frequency. —Curtiss-Wright Corp., Electronics Div., Carlstadt, N. J.
Circle **491** on inquiry card.

Scintillation System. New 8-page bulletin describes maker's "Model DS-7" scintillation counting system for aerial or ground surveying for oil or uranium deposits.—Nuclear Instrument and Chemical Corp., 229 W. Erie St., Chicago 10, Ill.
Circle **492** on inquiry card.

Scintillation Counter. New 2-page bulletin describes maker's "Airsco" scintillation counter for aircraft use. —Goldak Co., 1544 W. Glenoaks Blvd., Glendale 1, Calif.
Circle **493** on inquiry card.

OPTICAL

Surveying Instruments. New 114-page Catalog 50 describes maker's instruments for engineering and surveying, including transits, levels, alidades, plane tables, water level recorders and current meters, tripods, hand levels, plummets, etc.—W. & L. E. Gurley, Troy, N. Y.
Circle **494** on inquiry card.

Light Control. New 12-page illustrated Booklet 31-F-25 describes and illustrates maker's packaged "Luxtrol" light-control equipment for illumination control.—Superior Electric Co., Bristol, Conn.
Circle **495** on inquiry card.

Microscope. New 4-page bulletin describes maker's "Testall" shop microscope for examining surfaces of opaque materials.—William J. Hacker & Co., Inc., 82 Beaver St., New York 5, N. Y.
Circle **496** on inquiry card.

Airborne TV. New 2-page bulletin describes maker's closed-circuit television system for use in aircraft.—Davies Laboratories, Inc., 4705 Queensbury Rd., Riverdale, Md.
Circle **497** on inquiry card.

Photographic Enlargers. New 12-page Bulletin C.O.P. 1254-15 presents maker's line of "Solar" photographic enlargers.—Burke & James, Inc., 321 S. Wabash Ave., Chicago 4, Ill.
Circle **498** on inquiry card.

Interference-film Light Dividers. New 2-page Bulletin MI-318R presents maker's multi-layer interference films that utilize phenomenon of optical interference at boundaries of materials of high and low index of refraction to produce light division.—Fish-Schurman Corp., 70 Portman Rd., New Rochelle, N. Y.
Circle **499** on inquiry card.

Optical Alignment. New 4-page brochure describes composition, advantages and specifications of maker's optical alignment instrument.—King Instrument Co., 804 Northwestern Bank Bldg., Minneapolis 2, Minn.
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Photography. New 2-page bulletin describes and illustrates maker's "Rapromatic 4000" which photographs, develops and projects pictures in seconds.—Kenyon Instrument Co., Inc., 1345 New York Ave., Huntington Sta., N. Y.

Circle **501** on inquiry card.

Fused Quartz. New 2-page bulletin describes and illustrates maker's premium grades of fused quartz used in optical and electronic industries.—Amersil Co., Inc., 685 Ramsey Ave., Hillside 5, N. J.

Circle **502** on inquiry card.

MAGNETICS

Magnetism. New 8-page issue of "Applied Magnetics" (Vol. 3, No. 3) features article on "Fundamentals of Magnetism—a Guide for Product Designers."—Indiana Steel Products Co., Valparaiso, Ind.

Circle **503** on inquiry card.

Magnetic Equipment. New 6-page Bulletin B-207 describes maker's permanent-magnet equipment for steel and metal-working applications.—Eriez Mfg. Co., Erie, Pa.

Circle **504** on inquiry card.

Magnetic Testing Methods. New 4-page Bulletin DMF-1 features article on Magnetic Test Limits for Standard El Laminations."—Thomas & Skinner Steel Products Co., Inc., 1120 E. 23rd St., Indianapolis, Ind.

Circle **505** on inquiry card.

Electromagnet. New 2-page Catalog 18 describes maker's Isthmus Electromagnet for magnetic measurements at high field intensities.—Sunshine Scientific Instrument, 1810 Grant Ave., Phila. 15, Pa.

Circle **506** on inquiry card.

VISCOSITY

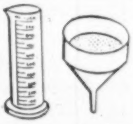
High-shear Viscometers. New 8-page Bulletin MSP-125 illustrates and describes maker's new principle high-shear viscometers, designed for paper coating slurries, etc.—Hagan Corp., Pgh., 30, Pa.

Circle **507** on inquiry card.

Automatic Viscosity Measurement. New 4-page Data Sheet VA-21 describes maker's "Viscometer" for automatically controlling starch cooking, eliminating laboratory viscosity determinations.—Norcross Corp., Newton 58, Mass.

Circle **508** on inquiry card.

LAB APPARATUS



Lab Equipment. New 64-page booklet "Labaratus" lists 350 of company's manufactured and specialty instruments, including price list.—Central Scientific Co., 1700 Irving Park Rd., Chicago, Ill.

Circle **509** on inquiry card.

Baths. New 4-page Bulletin 5515 describes and illustrates maker's "Magni Whirl" baths with built-in automatic stirring and circulating system.—Blue M Electric Co., 138th and Chatham St., Blue Island, Ill.

Circle **510** on inquiry card.

Lab Analyzer. New 12-page Bulletin FS-250 "Apparatus for Analysis by Electrodeposition" describes and illustrates maker's electro-analyzer, elecdropode, amperometric titrimeter, etc.—Fisher Scientific, 711 Forbes St., Pittsburgh 19, Pa.

Circle **511** on inquiry card.

Vacuum Oven. New 2-page bulletin describes maker's small low-cost vacuum oven and large heavy-duty vacuum oven with safety thermostat for low-pressure drying down to one micron or for atmospheric drying.—National Appliance Co., Portland, Ore.

Circle **512** on inquiry card.

ANALYTICAL

X-ray Scales. New 8-page issue of "Radiation Digest" features article on "Transparent X-ray Diffraction Scales Now Available for Wider Variety of Films and Spectrometer Charts."—X-Ray Dept., General Electric Co., Milwaukee 14, Wis.

Circle **513** on inquiry card.

Continuous Analyzer. New 2-page Data Sheet ND46-94 (1) describes and illustrates maker's continuous analyzer for free residual chlorine.—Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.

Circle **514** on inquiry card.

pH Meters. New 4-page electrode reference table gives specifications of maker's line of glass, metallic and reference electrodes.—Will Corp., P. O. Box 1050, Rochester 3, N. Y.

Circle **515** on inquiry card.

pH Meter. New 4-page bulletin describes and illustrates maker's "Model 110" line-operated electronic pH meter.—Photovolt Corp., 95 Madison Ave., New York 16, N. Y.

Circle **516** on inquiry card.

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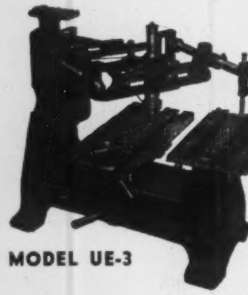

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NEW LITERATURE

Hg Vapor Meters. New 2-page descriptive bulletin illustrates maker's mercury-vapor meters for detecting toxic concentrations of mercury vapor in plant or lab atmospheres.—Harold Kruger Instruments, P. O. Box 164, San Gabriel, Calif.

Circle **517** on inquiry card.

Hg Vapor Detector. New 4-page Catalog 23 presents features of maker's mercury vapor detector.—Sunshine Scientific Instrument, 1810 Grant Ave., Phila. 15, Pa.

Circle **518** on inquiry card.

Spectrograph. New 4-page Bulletin 52 pictures and describes maker's 3-meter concave grating spectrograph that provides double any previous wavelength coverage in a single exposure.—Baird Associates, Inc., 33 University Rd., Cambridge, Mass.

Circle **519** on inquiry card.

Spectrophotometer. New 6-page folder describes maker's infrared spectrophotometer for spectrochemical analysis and control in metals production and fabrication, etc.—Baird Associates, Inc., 33 University Rd., Cambridge, Mass.

Circle **520** on inquiry card.

Spectrometer. New 4-page issue of "JAco News Letter" (Vol. 1, No. 6) describes maker's recording infrared spectrometer for absorption measurements, and recording emission spectra. —Jarrell-Ash Co., 26 Farwell St., Newtonville, Mass.

Circle **521** on inquiry card.

Oxygen Analyzer. New 4-page leaflet describes maker's "OXA-100" oxygen analyzer for rapid measurement of oxygen concentrations in air-oxygen mixtures.—Medical Instruments Research Associates, 2656 N. Pasadena Ave., Los Angeles 31, Calif.

Circle **522** on inquiry card.

Conductivity Testing Equipment. New 2-page Bulletin PT. No. 8647 D describes maker's Bouyoucos moisture meter; 4-page Bulletin A-6 describes "Model RD-15" Solu-Bridge soil tester for checking conductivity of soil extracts; 4-page Bulletin A-7 describes conductivity equipment for soil testing.—Industrial Instruments, Inc., 89 Commerce Rd., Cedar Grove, Essex County, N. J.

Circle **523** on inquiry card.

Soil Sampling Kit. New 4-page leaflet describes maker's soil sampling kit including twelve different earth and soil sampling tools used on airfield runways, brick making materials, sand and gravel pits, etc.—Soiltest, Inc., 4522 W. North Ave., Chicago 39, Ill.

Circle **524** on inquiry card.

X-ray Diffraction. New 12-page catalog presents description of mechanical, electric and electronic assemblies of maker's micro-focus x-ray diffraction units.—Jarrell-Ash Co., 26 Farwell St., Newtonville, Mass.

Circle **525** on inquiry card.

Infrared Spectroscopy. New 8-page issue of "Instrument News" (Vol. 6, No. 3) features article on "Infrared Spectroscopy By Reflection."—Perkin-Elmer Corp., Norwalk, Conn.

Circle **526** on inquiry card.

Spectrophotometers. New 8-page descriptive Bulletin 405 details requirements for variety of quantitative and qualitative applications and recommends particular type of spectrophotometer for each use.—Beckman Instruments, Inc., Fullerton, Calif.

Circle **527** on inquiry card.

Spectro Analyzer. New 8-page Bulletin FS-252 describes maker's multi-matrix, double-spectrum, all-electronic spectrograph.—Fisher Scientific Co., 713 Forbes St., Pittsburgh 19, Pa.

Circle **528** on inquiry card.

Hydrocarbon Analysis. New 22-page bulletin "Greater Accuracy and Speed in Light Hydrocarbon Analysis" presents diagrams on "Thermocon" recording and multiple-scale systems.—Podbielniak, Inc., 341 E. Ohio St., Chicago 11, Ill.

Circle **529** on inquiry card.

Stream Analyzers. New 8-page bulletin describes and illustrates four series of "Tri-Non" analyzers for continuous control of chemical process gas streams.—The Perkin-Elmer Corp., Norwalk, Conn.

Circle **530** on inquiry card.

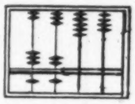
Cyanide Testing Pencil. New 2-page Bulletin presents maker's testing pencil for determining approximate free cyanide concentration of copper solutions.—Pollack Products Co., 1628 E. 7th St., Brooklyn 30, N. Y.

Circle **531** on inquiry card.

Chemical Testing Equipment. New 4-page Bulletin G-1-55 describes maker's chemical testing equipment, including pH comparator.—LaMotte Chemical Products Co., Towson, Baltimore 4, Md.

Circle **532** on inquiry card.

COMPUTING



Analog Computers. New 4-page Bulletin 25C-8-53 presents maker's "REAC Series 200 & 300" electronic analog computers.—Reeves Instrument Corp., 215 E. 91st St., New York 28, N. Y.

Circle **533** on inquiry card.

Analog Computer. New 8-page Technical Bulletin 302 pictures and describes maker's "Model 30" small analog computer for quantitative solution of physical and theoretical problems.—Donner Scientific Co., 2829 Seventh St., Berkeley 10, Calif.

Circle **534** on inquiry card.

Magnetic Memory. New 36-page Bulletin presents electrical and mechanical characteristics of maker's "Bi-Magstat" packaged static memory unit for application in pulse counting, digital memory, delay lines and multiplexing.—Butler Mfg. Corp., 5516 Dorsey Lane, Washington 16, D. C.

Circle **535** on inquiry card.

TIME, COUNT

Interval Timers. New 4-page Bulletin T-5 describes and illustrates maker's "Models ECA-3, ECA-4 & ECA-5" interval timers.—Seely Instrument Co., Inc., Niagara Falls, N. Y.

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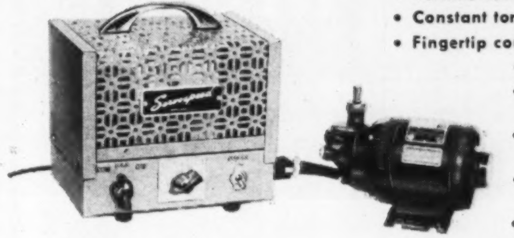

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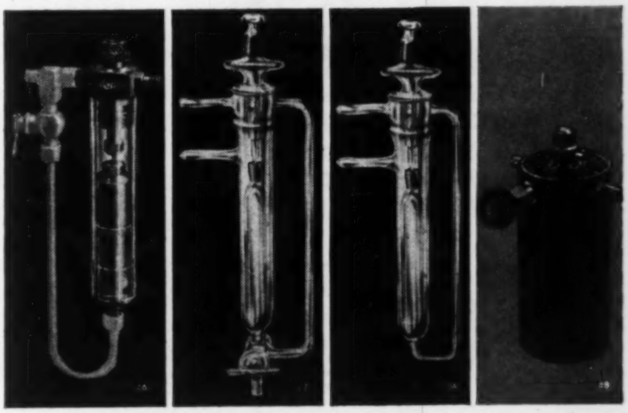

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For more information circle 111 on inquiry card.

NEW LITERATURE

Electronic Counters. New 2-page Catalog Sheet DCM8 presents description, applications, specifications and block diagram of maker's "Model DS-6100" frequency counter for measuring electrical, mechanical or optical phenomena at count rates to 100 kc.—Detectron Corp., 5528 Vineland Ave., N. Hollywood, Calif.

Circle **537** on inquiry card.

Time Stamp. New 2-page Bulletin 977 describes and illustrates maker's Tym-An-Dater" universal time stamp giving printed record of time and date.—Cincinnati Time Recorder Co., Cincinnati 14, Ohio.

Circle **538** on inquiry card.

Time-Interval Meter. New 4-page Catalog 20 presents description and specifications on maker's time-interval meter for measuring elapsed time between two electric impulses. 2-page Catalog 23 presents mercury-vapor detector.—Sunshine Scientific Instrument, 1810 Grant Ave., Philadelphia 15, Pa.

Circle **539** on inquiry card.

Time Switch. New 2-page Bulletin T-5022 presents dimensions and electrical data on maker's "Mark-Time 5400 Series" bell-signal time switch for use where combination of circuit-control and warning signal is desired.—M. H. Rhodes, Inc., 30 Bartholomew Ave., Hartford, Conn.

Circle **540** on inquiry card.

Electronic Timer. New 2-page Bulletin describes maker's "T-1 B 50" timer for interval, delayed action, repeat cycle, and two sequence timing.—Ferrara, Inc., 8106 W. Nine Mile Rd., Oak Park 37, Mich.

Circle **541** on inquiry card.

SPEED, FREQUENCY

Accelerometer Calibration. New 4-page issue of "Instrument Notes" (No. 29) features article on "A Basic Method of Determining the Dynamic Characteristics of Accelerometers by Rotation."—Statham Laboratories, Inc., 12401 W. Olympic Blvd., Los Angeles 64, Calif.

Circle **542** on inquiry card.

Speed Recording. New 8-page issue (Vol. 11, No. 2) of "Biddle News" discusses use of chronometric, centrifugal and resonant-reed tachometers for indicating and recording rotational speeds.—James G. Biddle Co., 1316 Arch St., Phila. 7, Pa.

Circle **543** on inquiry card.

Wind Indicators, Tachometers. New 2-page Bulletins 132-12 & 132-15 describe maker's wind-speed indicators and electric speed-indicators for indicating speed of rotary or linear motion and electrical frequencies to 150,000 rpm.—Westberg Mfg. Co., 144 S. Coombs St., Napa, Calif.

Circle **544** on inquiry card.

Tachometer. New 2-page Bulletin presents maker's "Model 1500 Ignition" tachometer for use on automotive engine test stands.—I-L-S Instrument Corp., 10701 Briggs Rd., Cleveland 11, Ohio.

Circle **545** on inquiry card.

ELECTRICAL, ELECTRONIC INSTRUMENTS

D-C Amplifiers. New 14-page Bulletin MSP-111.1 describes maker's Model "P" d-c amplifier for use with thermistors, strain gages, thermocouples, radiation pyrometers, etc., in telemetering, control systems, and preamplification.—Hagan Corp., Pittsburgh 30, Pa.

Circle **546** on inquiry card.

D-C Amplifiers. New Bulletin SRA presents characteristics and specifications on maker's magnetic-converter low-level "Model 2LHA-4" d-c amplifier for amplification and control.—Doelcam Div., Minneapolis Honeywell, Soldiers Field Rd., Boston 35, Mass.

Circle **547** on inquiry card.

Noise Voltmeter. New 2-page Bulletin describes and illustrates maker's "Millivac MV19A" signal-to-noise-ratio voltmeter that measures RMS noise voltages over range of 20 cps to 200 Mc.—Millivac Instrument Corp., P. O. Box 997, Schenectady 6, N. Y.

Circle **548** on inquiry card.

Digital Voltmeters, Converters. New set of 4-page Bulletins (200, 300 & 400) describe maker's digital voltmeters "Model DV 51B" for measuring and recording d-c voltages; "Model BD 40" binary decimal converter for converting binary numbers to decimal numbers; and digital in-line read-outs for application in systems requiring rapid and accurate visual indication.—Electro Instruments, Inc., 3794 Rosecrans St., San Diego 10, Calif.

Circle **549** on inquiry card.

Panel Indicators. New 2-page descriptive Bulletins MHD-155 illustrates maker's "Series HD-654" 3½" sealed round elapsed-time indicator and "Series HD-647" 2½" multiple-scale panel instruments.—DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.

Circle **550** on inquiry card.

Squaring Circuit. New 2-page Bulletin describes and illustrates maker's unitized 1-M squaring circuit.—EECO Production Co., 827 S. Vermont Ave., Los Angeles 5, Calif.

Circle **551** on inquiry card.

VTVM. New 4-page issue of "Hewlett-Packard Journel" (Vol. 6, No. 8) features article on new 600-kc VTVM.—Hewlett-Packard Co., 275 Page Mill Rd., Palo Alto, Calif.

Circle **552** on inquiry card.

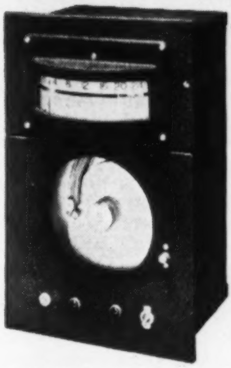
Transistor Testing. New 2-page catalog sheet illustrates and describes maker's transistor test equipment for lab and production applications.—Electronic Research Associates, Inc., P. O. Box 29, Caldwell, N. J.

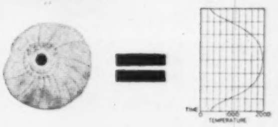
Circle **553** on inquiry card.

Mutual Conductance. New 8-page issue of "Electrical Measurements" (Vol. 22, No. 4) direct-reading mutual conductance instruments for measurement of tube characteristics.—Sensitive Research Instrument Corp., Mount Vernon, N. Y.

Circle **554** on inquiry card.

Pulse Equipment. New set of 2-page Bulletins describe maker's "Model 1310A" long-time delay generator,





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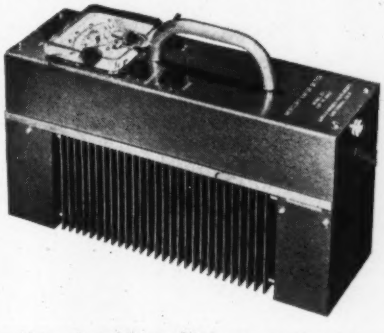

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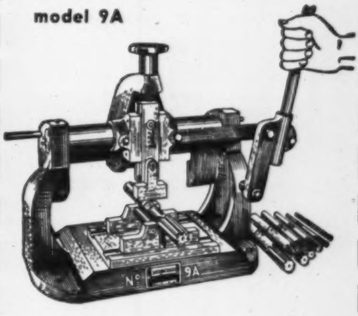

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NEW LITERATURE

"Model 3410A" and "Model 3420A" pulse oscillators and "Model 4120A" variable-pulse generator.—Electro-Pulse, Inc., 11811 Major St., Culver City, Calif.

Circle **555** on inquiry card.

Magnetic Amplifiers. New 2-page Bulletin MA describes maker's standard type magnetic amplifiers of toroidal construction.—Hycor Co., Inc., 11423 Vanowen St., N. Hollywood, Calif.

Circle **556** on inquiry card.

Signal Generators. New 2-page Bulletin describes maker's "Model 131" signal generator for testing and aligning circuits in range 7 to 70 Mc.—Avion Instrument Corp., 299 Highway 17, Paramus, N. J.

Circle **557** on inquiry card.

Pulse Generators. New 6-page Bulletin B-2A describes maker's "Model B-2A" pulse generator for producing pulses of accurately controlled widths, amplitude and time delay at low impedance.—Rutherford Electronics Co., 3707 S. Robertson Blvd., Culver City, Calif.

Circle **558** on inquiry card.

Pulse Control Systems. New 6-page illustrated brochure reviews maker's line of pulse-control equipment including pulse generators, delays, flip-flops, mixers and coincidence detectors, etc. —Burroughs Corp., 1209 Vine St., Philadelphia 7, Pa.

Circle **559** on inquiry card.

Frequency Meters, Test Equipment. New 8-page catalog describes maker's frequency meters, frequency interpolators and multipliers, standard ratio transformers, peak-reading wide-band pulse voltmeters, filters, etc.—Gertsch Products, Inc., 11846 Mississippi Ave., Los Angeles, Calif.

Circle **560** on inquiry card.

Oscillators. New 12-page issue of "The Experimenter" (Vol. 29, No. 12) features article on "Unit R-C oscillator—20 cycles to 500 kc."—General Radio Co., 275 Massachusetts Ave., Cambridge, Mass.

Circle **561** on inquiry card.

Crystal Ovens, Impedance Meters. New descriptive Bulletins presents maker's complete line of ovens for housing crystal units or electronic circuit; also crystal impedance meters for determination of equivalent electrical parameters of crystals.—Clark Crystal Co., Marlboro, Mass.

Circle **562** on inquiry card.

Circuit Analyzers. New 4-page leaflet presents specifications on maker's multicircuit continuity and leakage analyzers for up to 1200 circuit sections.—Dit-Mco., Inc., 505 W. 9 St., Kansas City, Mo.

Circle **563** on inquiry card.

Milliohmmeters. New 2-page illustrated Bulletin L-39 describes maker's milliohmmeters and microhmmeters for measuring low resistance on a linear scale.—Shallcross Mfg. Co., Collingdale, Pa.

Circle **564** on inquiry card.

Shaft-rotation Transducer. New 4-page Bulletin presents applications and specifications of maker's "Diviac" transducer for accurate translation of shaft rotation to electrical analog.—Feedback Controls, Inc., 1332 N. Henry St., Alexandria, Va.

Circle **565** on inquiry card.

Phase-Angle Meters. New 2-page Bulletin 75 describes and illustrates maker's portable phase-angle meter for checking relay and instrument connections.—Eastern Specialty Co., Philadelphia 40, Pa.

Circle **566** on inquiry card.

Differential-transformer Calibration. New 4-page Bulletin KCE-491 describes and illustrates method of evaluating transducers for absolute linearity, sensitivity, phase, and frequency characteristics.—Crescent Engineering & Research Co., 11632 McBean St., El Monte, Calif.

Circle **567** on inquiry card.

Bridge Indicator. New Technical Bulletin TB 3 3-55 describes and illustrates maker's "Model 101" resistance-bridge indicator for measuring output of resistance-bridge transducers.—American Helicopter, 1800 Rosecrans Ave., Manhattan Beach, Calif.

Circle **568** on inquiry card.

Electronic Equipment. New Bulletin G-255 describes maker's receivers, antenna kit, audio generator and frequency meter, turns ratio bridge, speed-chassis, half-size speed-chassis, rotating production table.—Specific Products, 14515 Dickens St., Sherman Oaks, Calif.

Circle **569** on inquiry card.

Signal Generator. New 4-page descriptive Bulletin presents specifications on makers FM/AM signal generator "Type TF 995A/1".—Marconi Instruments, Ltd., St. Albans, Hertfordshire, England.

Circle **570** on inquiry card.

Relay Amplifier. New 8-page Bulletin describes and illustrates maker's magnetic-amplifier-type relay amplifier for operating motors, heavy-duty relays, etc.—Goldak Co., 1544 W. Glenoaks Blvd., Glendale 1, Calif.

Circle **571** on inquiry card.

Transmission Lines. New 6-page leaflet presents data on maker's "Type V" vertebra flexible waveguide, "Type S" seamless corrugated flexible waveguide and "Type L" interlocked waveguide.—Technicraft Laboratories, Inc., Thomaston, Conn.

Circle **572** on inquiry card.

GAGING

Ring Gages. New 4-page bulletin illustrates and describes maker's "Boremaster" ring gages for gaging, setting, indicating bore gages and inside micrometers.—Size Control Co., 2500 W. Washington Blvd., Chicago 12, Ill.

Circle **573** on inquiry card.

Gaging Rule. New 2-page bulletin describes and illustrates maker's jointed stainless steel rule that can be used as a protractor.—George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y.

Circle **574** on inquiry card.

Height Gage. New bulletin describes maker's caliper and height gage permitting depth measurements in 1/1000" and 1/128" by vernier.—Geo. Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y.

Circle **575** on inquiry card.

Microcomparator. New 2-page Bulletin 552 describes maker's opposed-head, a-c electronic microcomparator for checking gage blocks in millionths or half-millionths.—Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.

Circle **576** on inquiry card.

Gage Block Accessories. New 6-page brochure presents maker's complete line of square and rectangular gage-block accessories.—Ellstrom Standards Div., Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.

Circle **577** on inquiry card.

Dial Indicators. New 4-page Bulletin 455 describes and illustrates maker's "Em-re" dial indicators with graduations from 0.0001 to 0.001 inch.—Petz-Emery, Inc., Pleasant Valley, N. Y.

Circle **578** on inquiry card.

Gage Blocks. New 28-page illustrated catalog describes maker's line of "ultra-finish" rectangular and "Hoke-type" gage blocks of steel and tungsten carbide.—Fonda Gage Corp., Dept. M-50, Stamford, Conn.

Circle **579** on inquiry card.

Contour Projector. New 4-page booklet presents specifications of maker's contour projector "Type PP-3" for laboratory, quality control, experimental work, etc.—Nife, Inc., Lambert Ave., Copiague, Long Island, N. Y.

Circle **580** on inquiry card.

TESTING, INSPECTION

Ultrasonic Tester. New 4-page brochure presents the "Metroscope" for ultrasonic thickness gaging and flaw detection.—Photocon Research Products, Pasadena 8, Calif.

Circle **581** on inquiry card.

Rotor Balancer. New 4-page booklet describes maker's rotor balancer for detecting components of rotor vibrations arising from static and dynamic unbalance.—M. Ten Bosch, Inc., Pleasantville, N. Y.

Circle **582** on inquiry card.

Hardness Tester. New 2-page Bulletin 160 describes maker's scratch-hardness tester for testing scratch-hardness and adhesion of industrial product finishes.—Gardner Laboratory, Inc., Bethesda 14, Md.

Circle **583** on inquiry card.

Surface Roughness. New 12-page illustrated Catalog 155 of Profilometer equipment for shop measurement of surface roughness, includes portable amplimeter, tracers for manual and mechanical operation, etc.—Micrometrical Manufacturing Co., 345 S. Main St., Ann Arbor, Mich.

Circle **584** on inquiry card.

Stress Analyzer. New 4-page bulletin describes and illustrates maker's X-ray diffraction "Androscope" stress analyzer for field, plant or lab operation.—Holger Andreasen, Inc., 703 Market, San Francisco 3, Calif.

Circle **585** on inquiry card.

POWER SUPPLIES

Solar Battery. New 2-page Technical Bulletin 1-55 describes maker's "Type S-1" silicon solar cell for electrical conversion of solar energy and photovoltaic applications.—National Fabricated Products, Inc., 2650 W. Belden Ave., Chicago 47, Ill.

Circle **586** on inquiry card.

Power Supplies. New 8-page catalog presents electrical and mechanical specifications of maker's standard- and laboratory-grade regulated power supplies.—New Jersey Electronics Corp., 345 Carnegie Ave., Kenilworth, N. J.

Circle **587** on inquiry card.

Power Supplies. New 2-page bulletins describe maker's "Model 107" instrument power supply and demodulator unit, and "Model 123" servo multiplier which provides d-c power for servo amplifiers.—Dynalysis Development Labs., Inc., 11941 Wilshire Blvd., Los Angeles 25, Calif.

Circle **588** on inquiry card.

Silvercel Batteries. New 4-page reprint describes maker's batteries in use on Sabre Jets. Accompanying Technical Data Sheet 01 presents specifications and capabilities of "HR-01 Silvercel" storage battery.—Yardney Electric Corp., 40-46 Leonard St., New York 13, N. Y.

Circle **589** on inquiry card.

Power Supplies. New 6-page illustrated folder presents specification of maker's voltage-regulated power supplies designed for relay rack or bench use.—Kepco Laboratories, 131-38 Sanford Ave., Flushing 55, N. Y.

Circle **590** on inquiry card.

TRANSISTORS, TUBES

Transistors. New 2-page data sheets cover maker's medium power silicon transistors "Types 951, 952 and 953" for high operating temperatures.—Texas Instruments, Inc., 6000 Lemmon Ave., Dallas 9, Texas.

Circle **591** on inquiry card.

Transistors. New 4-page issue of "International Rectifier News" RN-555 features article on "Transistor Triggers This Robot Eye."—International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif.

Circle **592** on inquiry card.

Semiconductors. New 4-page bulletin describes and illustrates maker's germanium and silicon semiconductor devices.—Pacific Semiconductors, Inc., 10451 W. Jefferson Blvd., Culver City, Calif.

Circle **593** on inquiry card.

RESISTORS, POTENTIOMETERS

Potentiometers. New 20-page Catalog E-53 presents specifications of maker's rectilinear potentiometers, pendulum indicator, dual rectilinear potentiometers, and linear accelerometer.—Edcliff Instruments, 383 N. Foothill Blvd., Pasadena 8, Calif.

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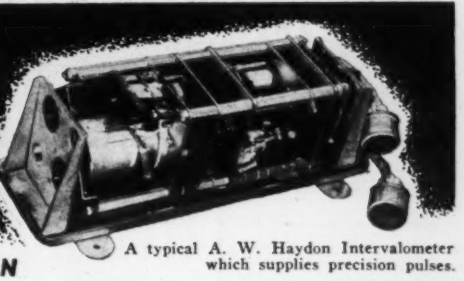

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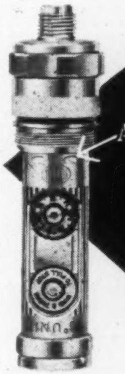

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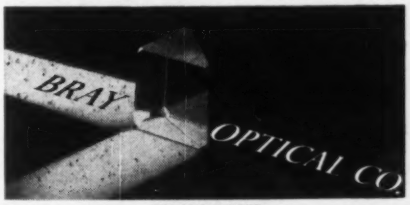

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NEW LITERATURE

Resistor Networks. New 2-page Bulletin C1031 describes maker's hermetically-sealed resistor networks for instrument and computer work.—Cinema Engineering Co., 1100 Chestnut St., Burbank, Calif.

Circle **595** on inquiry card.

Potentiometer. New 4-page illustrated Bulletin BC200-455 presents specifications of maker's 2" ball-bearing potentiometers for applications requiring exceptional precision.—DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.

Circle **596** on inquiry card.

Potentiometer. New 2-page Bulletin CO78-455 presents maker's "Series C-078" precision potentiometers for weight-reduction and miniaturization requirements.—DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.

Circle **597** on inquiry card.

Potentiometers. New Bulletin A10 5M describes maker's "ESIPOT" high-resolution potentiometers used in critical high-resolution balance control. —Electro-Measurements, Inc., 4312 S. E. Stark St., Portland 15, Ore.

Circle **598** on inquiry card.

Liquid Rheostat. New 8-page Bulletin 14B 8231 describes and illustrates maker's "Type 257" liquid rheostat for controlling wound-rotor motor drives and regulating speed on variable-torque applications.—Allis-Chalmers Mfg. Co., 942 S. 70th St., Milwaukee, Wis.

Circle **599** on inquiry card.

RELAYS, SWITCHES

Relays. New 64-page booklet presents proceedings of 1955 symposium on electro-magnetic relays, given at Oklahoma Institute of Technology.—Potter & Brumfield, Princeton, Ind.

Circle **600** on inquiry card.

Counter Switch. New 2-page Data Sheets 101 & P 103 picture and describe maker's heavy-duty low-force counter switch; and environment-proof switches used in both a-c and d-c applications.—Micro Switch Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill.

Circle **601** on inquiry card.

Plunger Relays. New 4-page Catalog 30 describes and illustrates maker's ceramic plunger mercury relays. 2-page bulletin describing maker's automatically-controlled water bath.—Philadelphia Scientific Glass Co., 1866 Eckard Ave., Abington, Pa.

Circle **602** on inquiry card.

Electronic Relay. New 2-page bulletin describes maker's "Model 600A"

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wall-mount sensitive electronic relay for remote-control applications.—Deltron, Inc., P. O. Box 192, Glenside, Pa.
Circle **603** on inquiry card.

Overload Signals, Switches. New 6-page Bulletin 19F describes and illustrates maker's overload signals and switches; universal tester for tensile, transverse, compression and shear testing; dynamometer for measuring traction, tension or weight; multi-low range universal tester and mechanical pressure gage.—W. C. Dillon & Co., Inc., 14606 Keswick St., Van Nuys 3, Calif.
Circle **604** on inquiry card.

Switches. New 10-page file-folder-type catalog contains operating data and electrical characteristics of maker's "Loxswitch" models.—R. B. Denison Mfg. Co., 102 St. Clair Ave., N. W., Cleveland 13, Ohio.
Circle **605** on inquiry card.

Switches. New 8-page Bulletin 504S describes maker's line of speed-sensitive switch governors for overspeed protection of engines and other rotating machinery.—Synchro-Start Products, Inc., 8151 N. Ridgeway Ave., Skokie, Ill.
Circle **606** on inquiry card.

Miniature Switches. New 4- and 6-page folders describe maker's "Eldec" subminiature rotary switches for low-current applications; also subminiature slip rings and brush holder assemblies.—Electro Development Co., 14701 Keswick St., Van Nuys, Calif.
Circle **607** on inquiry card.

Switches. New 2-page bulletin describes and illustrates maker's subminiature "TorBal" toggle switches for commercial and military applications.—The Torsion Balance Co., Electronics Div., Clifton, N. J.
Circle **608** on inquiry card.

Soleniods. New 2-page illustrated bulletin describes maker's "Model 425 & 463" explosion proof d-c solenoid.—Braunson Electronics, Inc., 411 Rose Ave., Venice, Calif.
Circle **609** on inquiry card.

Signalling Monitor. New 2-page bulletin presents maker's hand-reset rotary circuit-breaker indicator for monitoring and protective use.—Allard Instrument Corp., 30 Broad St., New York 4, N. Y.
Circle **610** on inquiry card.

CONNECTORS

Compression Plugs. New 12-page Catalog 300 pictures and describes maker's "Vac-Tite" compression plugs in octal and loctal types, miniatures, and miniature rectangulars.—Hermetic Seal Products Co., 29-37 Sixth St., Newark 7, N. J.
Circle **611** on inquiry card.

Printed-circuit Connectors. New 2-page illustrated bulletin describes maker's "Series "PCW22" printed-circuit connectors for computer applications.—DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.
Circle **612** on inquiry card.

Connectors. New 2-page data sheets describe maker's special design connectors for high-altitude applications.—DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.
Circle **613** on inquiry card.

Connectors. New 8-page bulletin presents specifications of maker's

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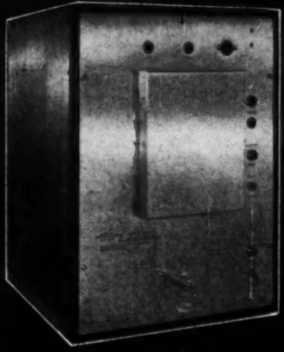

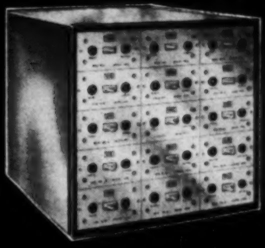

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NEW LITERATURE

miniature connectors for portable, airborne, rack to panel, and cable to panel applications.—Gorn Electronics Div., Gorn Electric Co., Inc., Stamford, Conn.

Circle 614 on inquiry card.

Jacks, Plugs. New 2-page illustrated bulletin describes maker's subminiature combination jack and plug used with computers, recorders, radios, etc. —Telex, Inc., Telex Park, St. Paul 1, Minn.

Circle 615 on inquiry card.

Hermetic Feed-Thru. New 4-page catalog 400 presents maker's "ES and FS Series Vac-Tite" compression, single-terminal feed-thru and stand-off seals.—Hermetic Seal Products Co., 29-37 S. Sixth St., Newark 7, N. J.

Circle 616 on inquiry card.

TRANSFORMERS

Transformers. New 32-page Catalog TR-55 and television replacement guide TV-155, list 685 items including audio transformers, power components, rectifier transformers, etc.—Triad Transformer Corp., 4055 Redwood Ave., Venice, Calif.

Circle 617 on inquiry card.

Transformers. New 24-page Catalog S-101 describes and illustrates 243 of maker's "Stancor" transformers and related components.—Chicago Standard Transformer Corp., Addison and Elston Avenues, Chicago 18, Ill.

Circle 618 on inquiry card.

Transformers. New 20-page catalog describes maker's transformers for military equipment and designed to meet MIL-T-27 requirements.—General Transformer Co., 18240 Harwood Ave., Homewood, Ill.

Circle 619 on inquiry card.

ELECTRONIC COMPONENTS

Electronic Components. New 16-page illustrated Catalog D-55 describes maker's electronic components including ceramics, stand-off and feed-thru insulators, sockets, printed circuits, etc.—Erie Resistor Corp., Erie, Pa.

Circle 620 on inquiry card.

Ceramic Capacitors. New 2-page Bulletin EP-48 presents characteristics of maker's ISO-KAPS molded-disc ceramic capacitors.—Centralab Div., 900 E. Keefe Ave., Milwaukee 1, Wis.

Circle 621 on inquiry card.

Electrical Accessories. New Catalog B4 lists maker's complete line of "Amphenol" components, connectors, coaxial cables, radio sockets and plugs, TV antennas, etc.—American Phenolic Corp., Chicago 50, Ill.

Circle 622 on inquiry card.

Microwave Components. New 4-page bulletin "Progress in Microwave Transmission" pictures and describes maker's facilities for producing relays, transformers, calibrators, detectors, etc.—Technicraft Laboratories, Inc., Thomaston, Conn.

Circle 623 on inquiry card.

Portable Cords. New 8-page Booklet DM-5538 presents maker's complete line of portable cords including "Securityflex" abrasion-, moisture-, and acid-resistant service cords.—Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

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Printed Circuits. New 2-page Bulletin M-1 describes maker's "Type MCR" molded printed electronic circuits for use in various parts of radio and TV receivers.—International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

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AIR, MOISTURE

Dehydration Units. New 8-page Bulletin 16.0.081 describes and illustrates maker's packaged dehydration units for drying air or gases in industrial, processing and lab installations.—J. F. Pritchard & Co., of Calif., 4625 Roanoke Parkway, Kansas City 12, Mo.

Circle **626** on inquiry card.

Compressors. New 2-page Bulletins 604 & 605 describe maker's "Class ATCL and ATHL Oilfreair and Oilfregas" compressors for oil-free air or gas.—Pennsylvania Pump & Compressor Co., Easton, Pa.

Circle **627** on inquiry card.

JIC Pneumatic Standards. New 12-page copy of "J. I. C. Pneumatic Standards for Industrial Equipment" includes revisions made in Jan. 1955 meeting of Joint Industry Conference.—Miller Fluid Power Co., 2040 N. Hawthorne Ave., Melrose Park, Ill.

Circle **628** on inquiry card.

Recording Hygrometers. New bulletin describes maker's recording hygrometers for measuring percentage of relative humidity.—Draper Mfg. Co., New York, N. Y.

Circle **629** on inquiry card.

FILTERS

Air Filters. New 8-page Bulletin 117 describes maker's line of Poro-Stone filters for compressed air and gases.—R. P. Adams Co., Inc., 225 E. Park Drive, Buffalo 17, N. Y.

Circle **630** on inquiry card.

Filters. New 4-page leaflet presents description of maker's all-purpose "Millipore" filter for atomic-energy field.—Millipore Filter Corp., 36 Pleasant St., Watertown 72, Mass.

Circle **631** on inquiry card.

Water Filters. New Bulletin 214 presents description of standard sizes of water filters with stainless-steel filters to handle 8 to 939 gpm.—Micro Metallic Corp., 30 Sea Cliff Ave., Glen Cove, N. Y.

Circle **632** on inquiry card.

Steel Filters. New 4-page Bulletin 213 presents prices and application data on maker's range of stock filters with porous stainless-steel elements.—Micro Metallic Corp., 30 Sea Cliff Ave., Glen Cove, N. Y.

Circle **633** on inquiry card.

GYROSCOPES

Gyroscopes. New 4-page Brochure SA78-2 describes maker's rate gyroscopes used in guided missiles, autopilots, antenna stabilations, etc.—The United States Time Corp., 500 Fifth Ave., New York 36, N. Y.

Circle **634** on inquiry card.

MECHANICAL COMPONENTS

Diaphragm Seals. New 20-page bulletin presents maker's "Bellofram" seals for use in valves, pressure switches, remote positioners, etc.—Bellofram Corp., Blanchard Rd., Burlington, Mass.

Circle **635** on inquiry card.

Neg'ator Springs. New 16-page Bulletin 310N describes maker's Neg'ator spring made for loading, counterbalancing, feeding, driving, retracting, etc.—Hunter Spring Co., Lansdale, Pa.

Circle **636** on inquiry card.

Hermetic Seals. New 20-page illustrated catalog lists all basic types of maker's hermetic terminals, terminal boards, rubber coatings and insulating terminals.—Silicone Seals, Inc., 3125 Milwaukee Ave., Chicago 18, Ill.

Circle **637** on inquiry card.

Capillary Tubes. New 4-page bulletin describes maker's glass capillary tubes used for containing vaccines, for determining blood coagulation time rates, etc.—Friedrich and Dimmock, Inc., Lincoln Ave., Millville, N. J.

Circle **638** on inquiry card.

Cases. New 16-page catalog describes and illustrates maker's line of sales and service cases plus suggestion for special made-to-order cases. Includes price list.—Knickerbocker Case Co., 501 W. Huron St., Chicago 10, Ill.

Circle **639** on inquiry card.

Fasteners. New 4-page brochure describes and illustrates maker's custom fasteners, screws, standard stock items, etc.—Abbott Products, Inc., 150-50 12th Ave., Whitestone 57, N. Y.

Circle **640** on inquiry card.

Damping Devices. New 22-page booklet presents information on design and operation of maker's shock-absorbing damping devices, and provides a review of fundamental scientific principles in controlling linear or oscillatory motion.—The Gabriel Co., 1148 Euclid Ave., Cleveland 15, Ohio.

Circle **641** on inquiry card.

Vibration Mounts. New 6-page Bulletin 700 describes and illustrates maker's "Temproof" mountings for vibration and shock control.—Lord Mfg. Co., Erie, Pa.

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Springs. New 8-page issue of "The Mainspring" June 1955 features article on "A Retrospective Ramble in the Field of Spring Science.—Associated Spring Corp., Bristol, Conn.

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8	0.025	94.6
9	0.016	60.5
10	0.010	37.8
11	0.0063	23.85
12	0.0040	15.14
13	0.0025	9.46
14	0.0016	6.05
15	0.0010	3.78
16	0.00063	2.38
17	0.00040	1.514
18	0.00025	0.946
19	0.00016	0.605
20	0.00010	0.378
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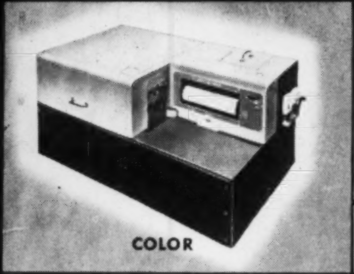
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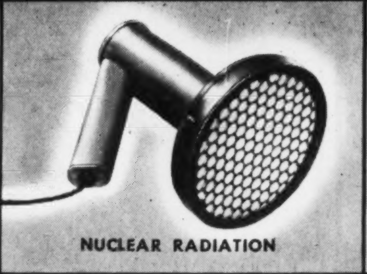
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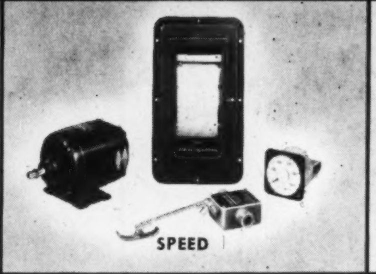
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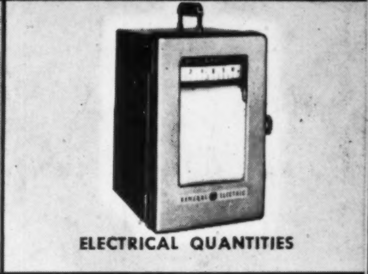
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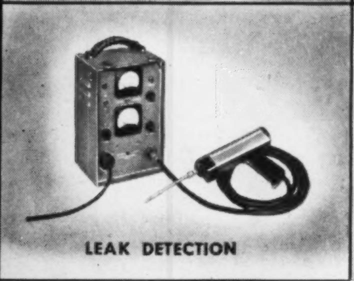
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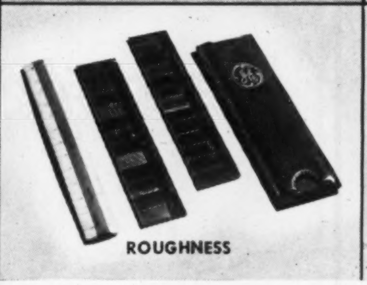
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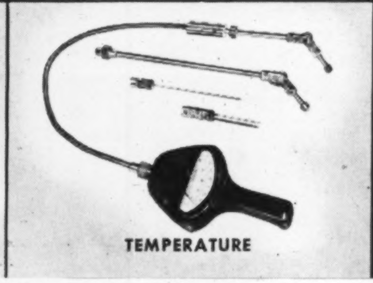
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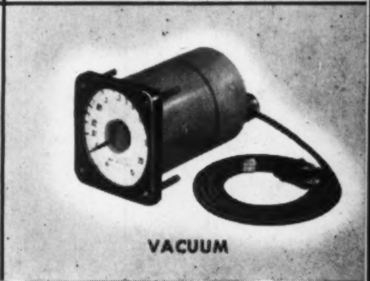
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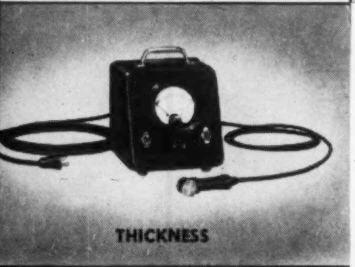
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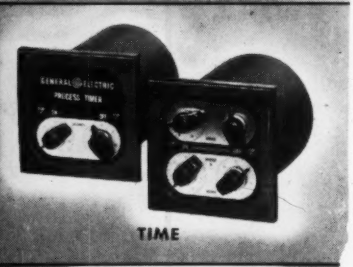
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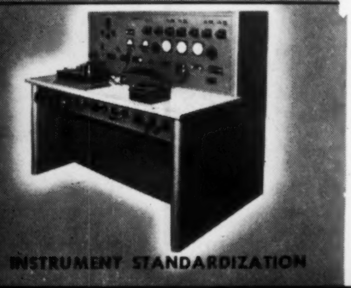
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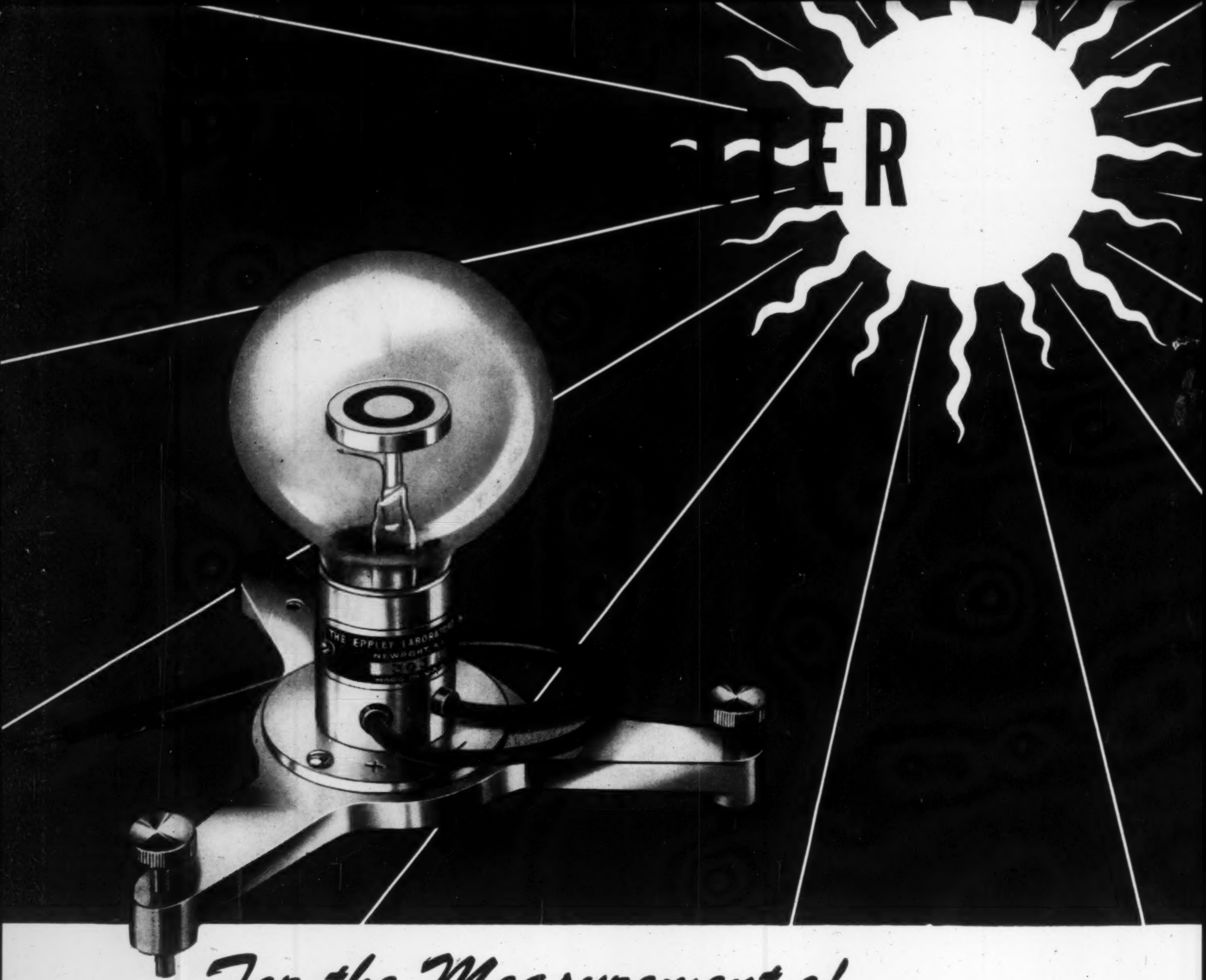

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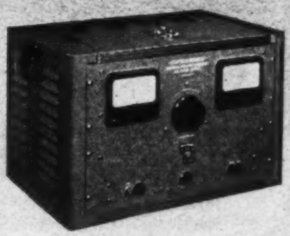
REGULATION: ± 1% (a) from 5-32 Volts D.C. (b) from 1.5 to 15 amps. (c) from 105-125 Volts A.C. (Single phase, 60 cps.)

RIPPLE: 1% rms @ 32 Volts and full load, increases to max. of 2% rms @ 5 Volts and full load.

RESPONSE: 0.2 Seconds
METERS: 4½" AM and VM
DIMENSIONS: 22" x 17" x 14½
MOUNTING: Cabinet or 19" Rack Panel
FINISH: Baked Grey Wrinkle
WEIGHT: 150 lbs.



MODEL M60VMC • 0 to 32 VOLTS @ 25 AMPS. (CONT.)

REGULATION: ± 1%* (a) At 28 volts DC — Increases to 2% max. over the range 24-32 V.; does not exceed 2 volts regulation over the range 4-24 volts D.C. (b) From 1/10 Full Load to Full Load. (c) At a fixed A.C. Input of 115 Volts.

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WEIGHT: 130 lbs.
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*This unit is an economical solution to your power supply needs if stabilization for A.C. Voltage changes are not required. If this is required, see Model MR1040-30 below.

MODEL MR1040-30 • 10 to 40 VOLTS @ 30 AMPS. (CONT.)

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RIPPLE: 1% rms
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RESPONSE: 0.2 Sec.
METERS: 4½" AM and VM
MOUNTING: Cabinet (or 19" rack panel)
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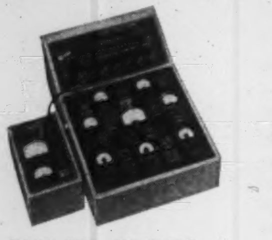

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Model 700: Most complete and accurate Tube Tester. Covers wide ranges of values to duplicate the results in tube manuals. This instrument is invaluable for electronic developmental and research work. **Model 7001:** Null Reading Apparatus, for use with the Model 700 to obtain bridge type Null readings with an accuracy of 1%. Most complete and accurate tube Tester available. 7 other HICKOK tube testers are available to fill all your requirements.

MODEL 209A

TRUE VACUUM TUBE VOLTMETER

Laboratory Size and Accuracy

Model 209A: Contains large 9″ meter with zero-center scale. Highly accurate for servicing industrial electronic equipment. DC Volts: 0-1200 in 6 ranges. AC RMS Voltage: 0-1200 V. in 6 ranges. AC Peak-to-Peak Voltage: 0-1200 V. in 6 ranges. Capacitance 0.1 to 10,000 MMF in 2 ranges, 0-1000 MF in 5 ranges. 50 MH to 100 henries. 0.1 ohm to 10,000 megohms in 7 ranges.

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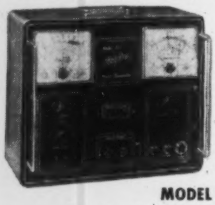
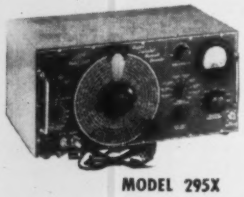


MODEL 755

NOISE GENERATOR

Industrial & Technician Model

Model 755: The first noise generator to be completely self-contained. Has two indicating meters. This instrument is divided into two parts—VTVM side and Generator Noise side. Permits noise level adjustments to improve sound and video in TV receivers. Ranges: 0-0.1, 0.5, 1.0 and 5.0 Volts, zero-center DC scale. Frequency rangeflat from 10 to 250 MC. Noise level: 0-20 db.



MODEL 295X

MICROVOLT SIGNAL GENERATOR

125 KC to 175 MC On Fundamentals

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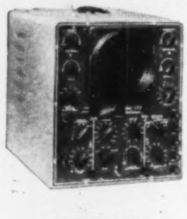

MODEL 770

LABORATORY CATHODE RAY OSCILLOSCOPE

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Model 770: Provides unusually wide range of DC to 5 MC without sacrifice to 10 M. V. RMS per inch sensitivity. Built-in calibrating voltages. Illuminated calibrated screen. Mu-metal shield. Shock mounted. This highly stable 'Scope is laboratory quality throughout... Moderately priced. Test leads are furnished. 5 other Hickok oscilloscopes are available.

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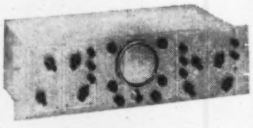

MODEL 385R

Model 385R: DC to 4MC, within 3db. .075 RMS volts per inch sensitivity. Sweep circuit oscillator; 3 cycles to 50 KC. Input impedance: vertical and horizontal amplifiers; 2.2 megohms — 25 mmf. Features replaceable circuit sections. High quality throughout. Also available in portable, moisture-proof case with telescopic light shield as preferred by field engineers.

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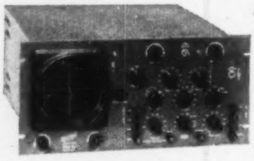

MODEL 670R

Model 670R: DC to 600 KC, within 3db. Useable to beyond 2MC. .015 RMS volts per inch sensitivity. Sweep circuit oscillator; 3 cycles to 50 KC. Fixed sweep frequencies; 30 and 7875 cycles. Input impedance: vertical, 2.2 megohms—15 mmf; horizontal, 1 megohm—35 mmf. Features illuminated calibrated screen. Also available in portable case as Model 670.

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BL-4305	Vibration Pickup
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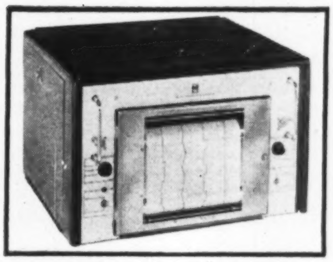
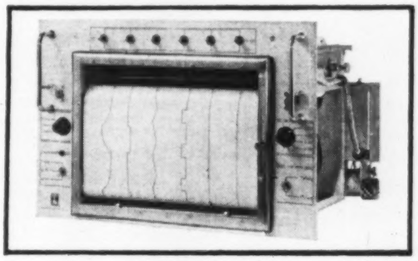
Oscillographs



Model BL-254, Four-Channel.



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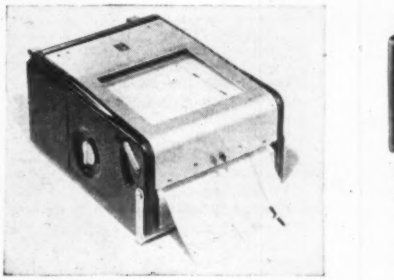

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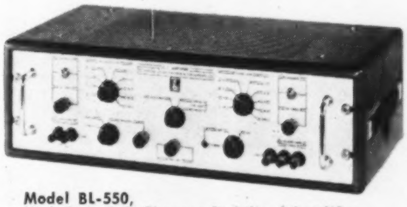

Model BL-550,
High Gain D.C. Chopper Stabilized Amplifier.

For complete information write Brush Electronics Company, Department EE, 3405 Perkins Avenue, Cleveland 14, Ohio.

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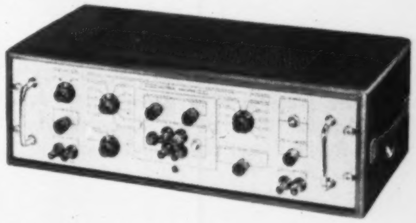

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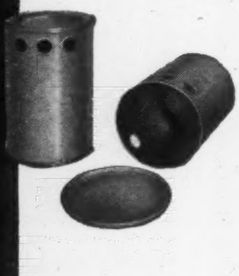

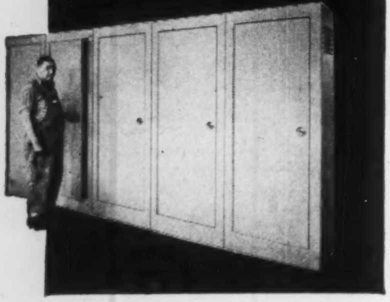

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THE 1956 *Instruments & Automation* CATALOG AND INDEX

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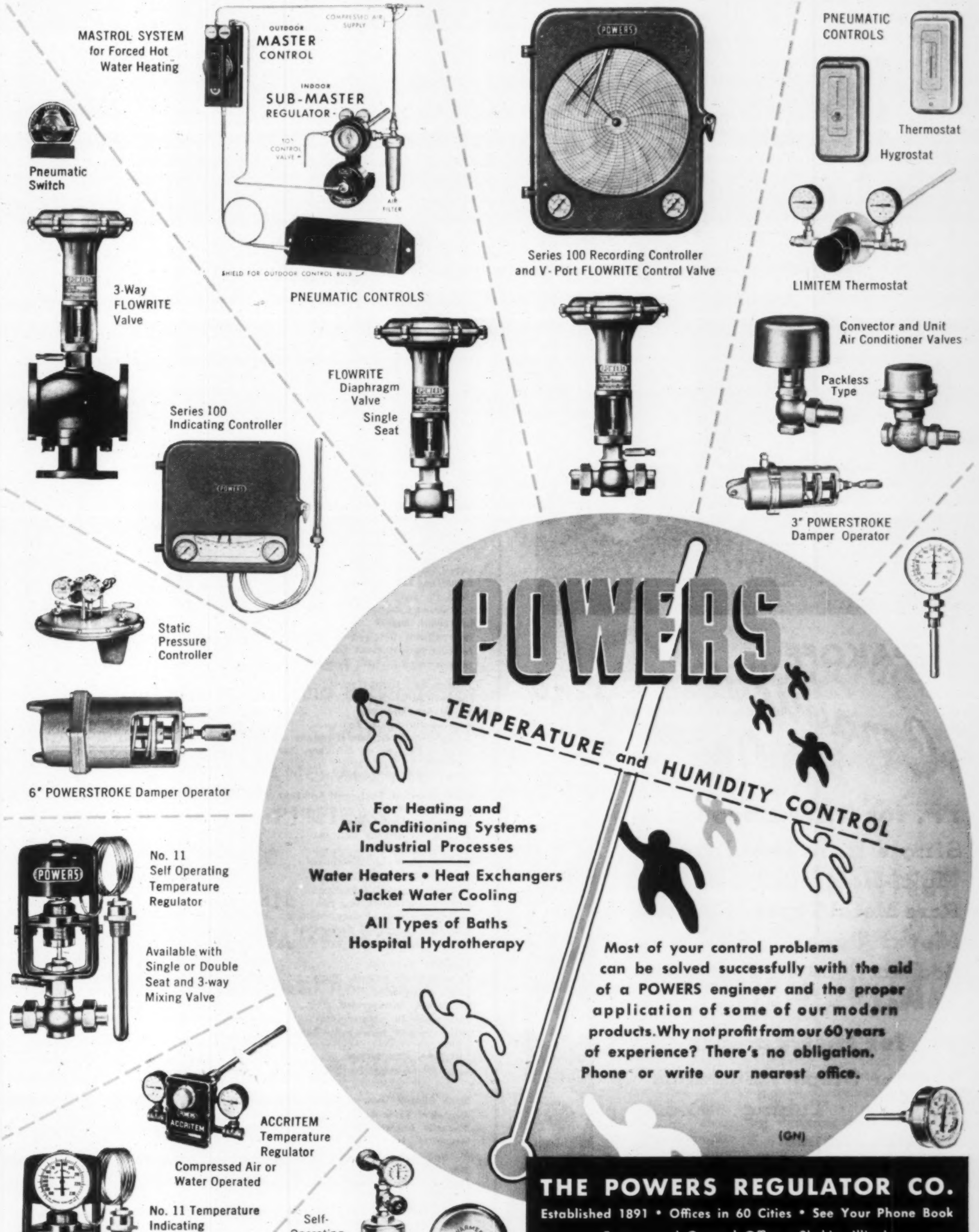

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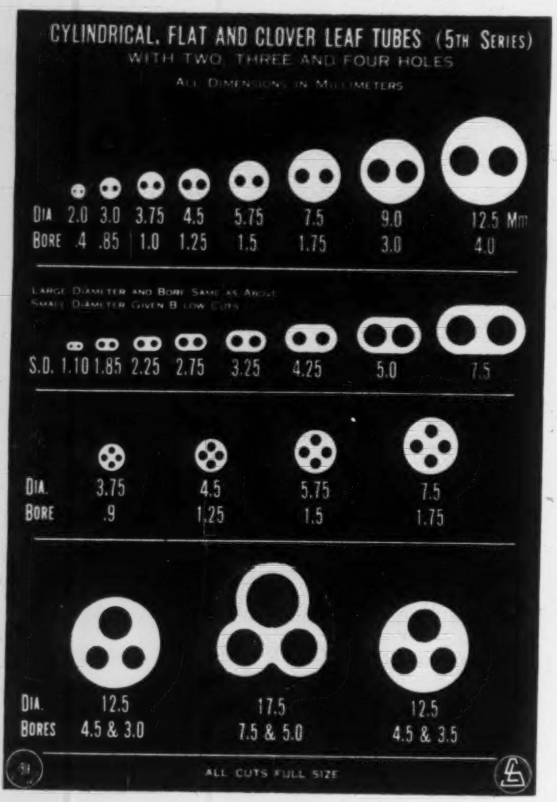
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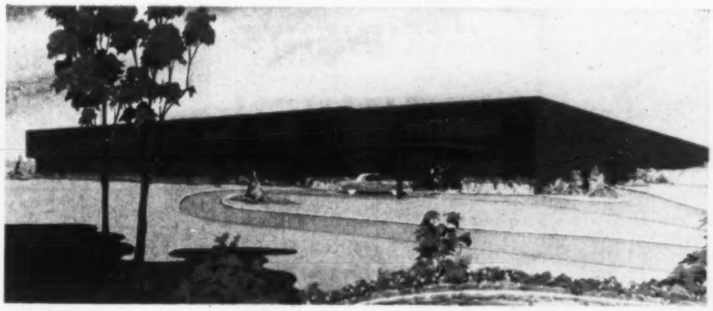

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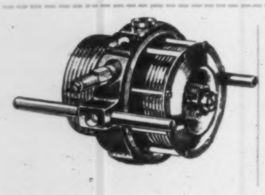
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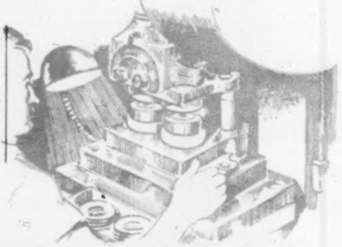

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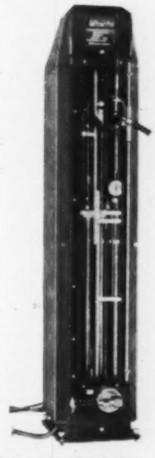
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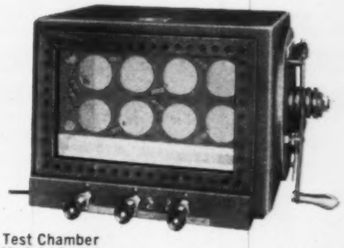
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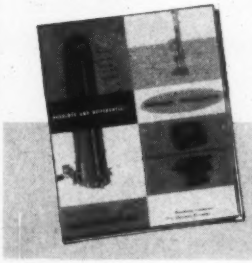

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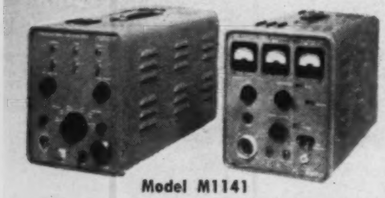

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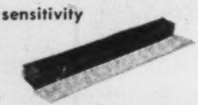

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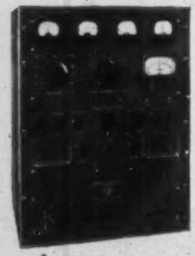

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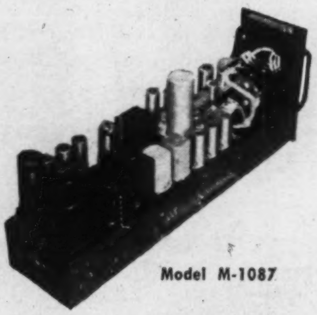

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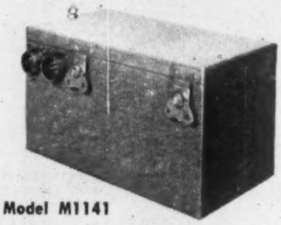

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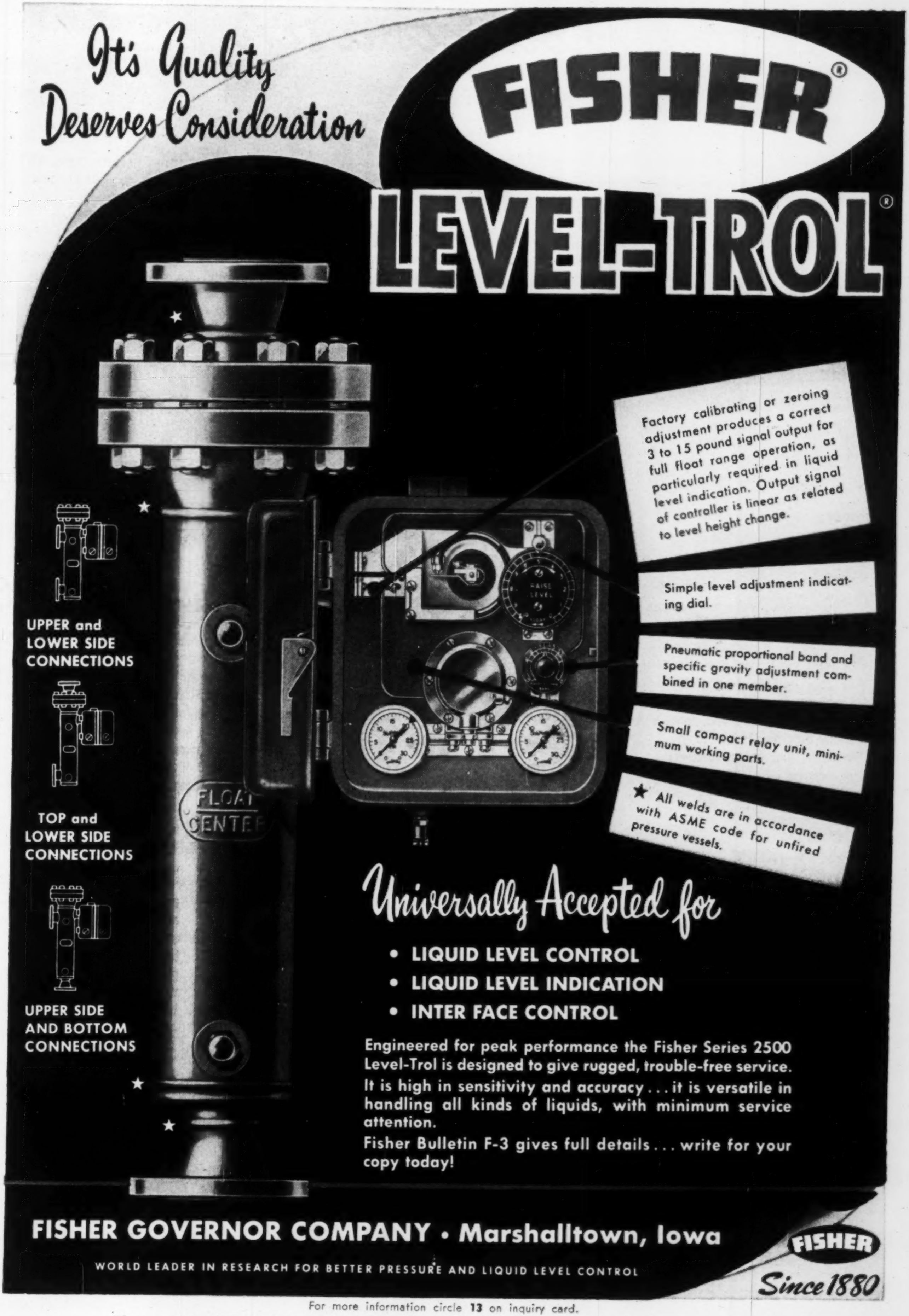

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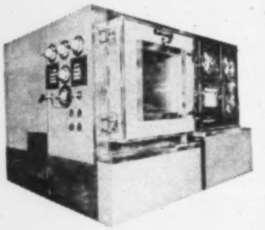

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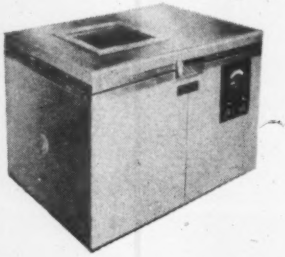

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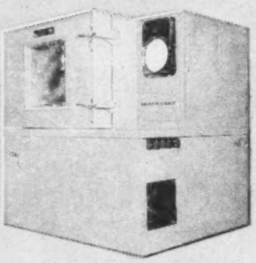

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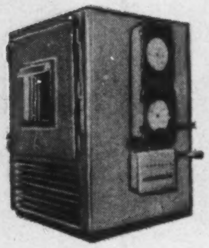

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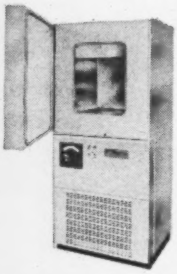

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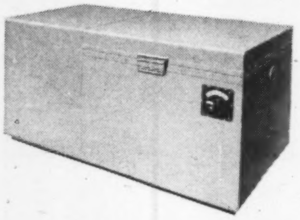

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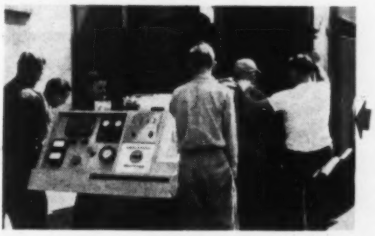

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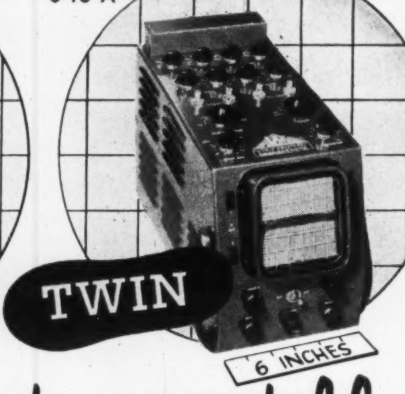
6 INCHES

S-15-A



...light...compact...accurate...portable

Featuring small size, light weight and outstanding performance the HIGH, WIDE and TWIN POCKETSCOPES have become the "triple threat" of the oscilloscope field. Their incomparable versatility, reliability and accuracy have skyrocketed this team of truly portable instruments into unparalleled demand. Each oscilloscope features DC coupled amplifiers in both vertical and horizontal channels.

HIGH

The S-14-A HI-GAIN POCKETSCOPE provides the optimum in oscilloscope flexibility for analysis of low-level electrical impulses. Extremely light weight (12¾ lbs.), compact in size (12 x 5¾ x 7 in.), dependable and accurate in performance. Vertical and horizontal channels: 10mv rms/inch with response within 2DB from DC to 200 KC and pulse rise of 1.8 μs . . . non-frequency discriminating attenuators and gain controls with internal calibration of trace amplitude . . . repetitive or trigger time base with linearization from ½ cycle to 50 KC with ± sync or trigger.

WIDE

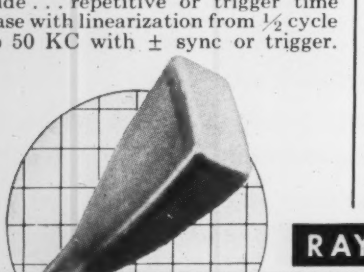
The S-14-B WIDE BAND POCKETSCOPE is ideal for investigations of transient signals, DC signals, aperiodic pulses or recurrent waveforms. Vertical channel: 50 mv rms/in. within —2DB from DC to 700 KC . . . pulse rise time of 0.35 μs. Horizontal channel: 0.15v rms/in. within —2DB from DC to 200 KC . . . pulse rise of 1.8 μs. Attenuators and gain controls are non-frequency discriminating . . . trace amplitude calibration . . . repetitive or triggered time base from ½ cycle to 50 KC . . . ± sync or trigger . . . trace expansion, filter graph screen and many other features . . . 14 lbs. . . . 12 x 6 x 7 inches.

TWIN

The S-15-A POCKETSCOPE is a portable, twin tube, high sensitivity oscilloscope with two independent vertical as well as horizontal channels. It is indispensable for investigation of electronic circuits in industry, school and laboratory. Vertical channels 10 mv rms/in. with response within—2DB from DC to 200 KC and pulse rise time of 1.8 μs . . . horizontal channels 1v rms/in. within —2DB from DC to 150 KC . . . non-frequency discriminating controls . . . internal signal amplitude calibration . . . linear time base from ½ cycle to 50 KC, triggered or repetitive, for both horizontal channels.

S-11-A

The S-11-A INDUSTRIAL POCKETSCOPE is a small, compact (5x7x11 inches), and lightweight (8¾ lbs.) instrument for observing electrical circuit phenomena. The flexibility of the POCKETSCOPE permits its use for AC measurements as well as for DC. The vertical and horizontal amplifiers are capable of reproducing within —2DB from DC to 200 KC with a sensitivity of 0.1v rms/in. . . . repetitive time base from 3 cycles to 50 KC continuously variable throughout its range . . . variations of input impedance, line voltage or controls do not "bounce" the signal—the scope stabilizes immediately.



RAYONIC CATHODE RAY TUBES BY WATERMAN

TUBE	PHYSICAL DATA		STATIC VOLTAGE		DEFLECTION*		LIGHT OUTPUT**
	FACE	LENGTH	A3	A2	VERT	HOR	
3JP1	3"	10"	3000	1500	111	150	352
3MP1	3"	8"		750	99	104	33
3RP1	3"	9.12"		1000	61	86	44
3SP1	1.5x3"	9.12"		1000	61	86	44
3XP1	1.5x3"	8.875"		2000	33	80	218

*Deflection in volts per inch.

The basic properties of the cathode ray tube that concern the designer or the user are: deflection sensitivity, unit line brightness, line width, static voltage requirements and physical size. A comparison between cathode ray tubes manufactured by Waterman Products Company is shown in the table adjoining. These tubes are available in P1, P2, P7 and P11 phosphors. 3JP1, 3JP7, 3SP1 and 3XP1 are available as JAN tubes.

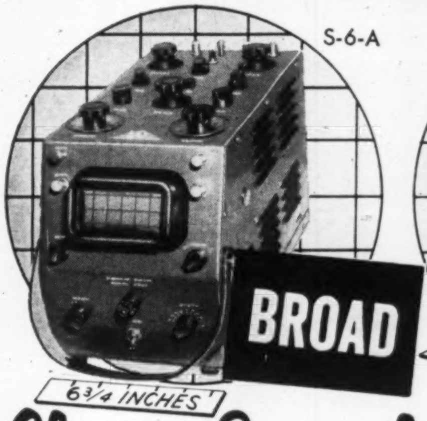
Write for your complimentary copy of "POCKETSCOOP" • Official Waterman publication.

For more information circle **16** on inquiry card.

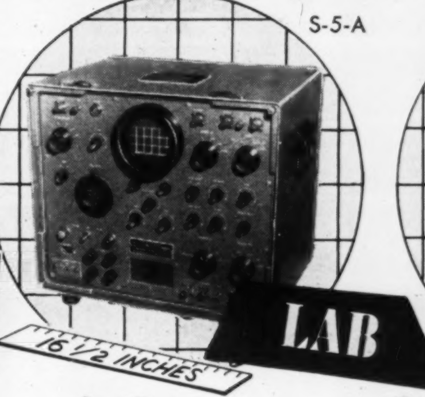
PULSESCOPE by Waterman

The Oscilloscope that Portrays the Pulse

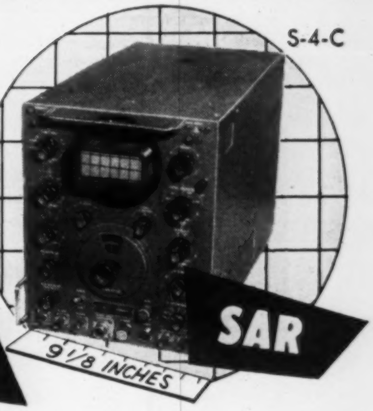
S-6-A



S-5-A



S-4-C



Classic Examples of Precision Engineering...

The PULSESCOPES are cathode ray tube oscilloscopes that portray the attributes of the pulse: shape, amplitude, duration and time displacement. All PULSESCOPES have internally generated markers with the basic difference that in the SAR PULSESCOPE the markers initiate the sweep while in the others the sweep starts the markers.

BROAD

The S-6-A BROAD BAND Scope is a PULSESCOPE in performance, POCKETSCOPE in size. The instrument measures DC as well as AC signals. Unique DC calibration methods permit rapid measurements of either positive or negative, AC or DC signals. Vertical amplifier sensitivity of 0.2v rms/inch, and response to 5 mc within 3DB . . . pulse rise time of 0.1 μs . . . internal markers from 1 to 1000 μs . . . repetitive or trigger sweep from 5 cycles to 500 KC with 5X sweep expansion . . . sweep, marker and DC calibrating voltage available externally. Size 8½ x 6¾ x 13¾ in. Weight 22 lbs. Operates from 50 to 400 cycles at 115 volts AC.

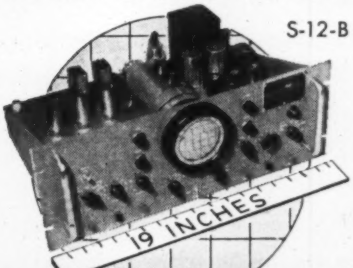
LAB

The S-5-A LAB PULSESCOPE is a JANized (Gov't Model No. OS-26) portable, AC, wide band-pass, laboratory oscilloscope ideal for pulse as well as general purpose measurements. Internal delay of 0.55 μs permits observation of pulse leading edge. Includes precision amplitude calibration, 10X sweep expansion, internal trace intensity time markers, internal trigger generators and many other features. Video amplifier 0.1v p to p/inch . . . pulse rise time of .035 μs or response to 11 mc. 1.25 to 125,000 μs triggered or repetitive sweep . . . internally generated markers from 0.2 to 500 μs . . . trigger generator from 50 to 5000 pps. for internal and external triggering. Operates from 50 to 400 cycles at 115 volts AC.

SAR

The S-4-C SAR PULSESCOPE is a JANized (Gov't Model No. OS-4) portable instrument (31.5 lbs.) for precision pulse measurements for radar, TV and all electronic measurements. Portrays all attributes of the pulse . . . internal crystal controlled markers of 10 and 50 μs available for self-calibration . . . in R operation a small segment of the A sweep is expandable for detailed observation with a direct-reading calibrated dial accurate to 0.1%. Video amplifier band-pass up to 11 mc . . . optional video delay 0.55 μs . . . pulse rise and fall time better than 0.07 μs . . . R pedestal (sweep) 2.4 to 24 μs . . . video sensitivity of 0.5v. p to p/inch. Easily convertible from μs to yards. Operates from 50 to 400 cycles at 115 volts AC.

S-12-B



RAKSCOPE

Because the panel is only 7″ high and fits any standard rack, the S-12-B RAKSCOPE admirably fills the need for a small oscilloscope of wide versatility. With all the features of the S-11-A POCKETSCOPE, the RAKSCOPE is JANized (Gov't Model No. OS-11), and has many additional advantages; the sweep, from 5 cycles to 50 KC, is either repetitive or triggered . . . vertical and horizontal amplifiers are 50 mv rms/inch with band-pass from 0 to 200 KC . . . special phasing circuitry for frequency comparison.

WATERMAN PRODUCTS CO., INC.

WATERMAN PRODUCTS

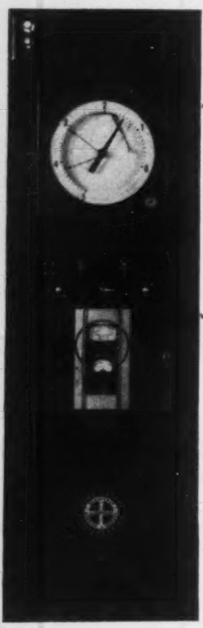
PHILADELPHIA 25, PENNA., U.S.A.

CABLE ADDRESS, POKETSCOPE, PHILA.

Manufacturers of POCKETSCOPES® • RAKSCOPES® • PULSESCOPES® and RAYONIC® TUBES

For more information circle **16** on inquiry card.

M·S·A PROCESS CONTROL INSTRUMENTS



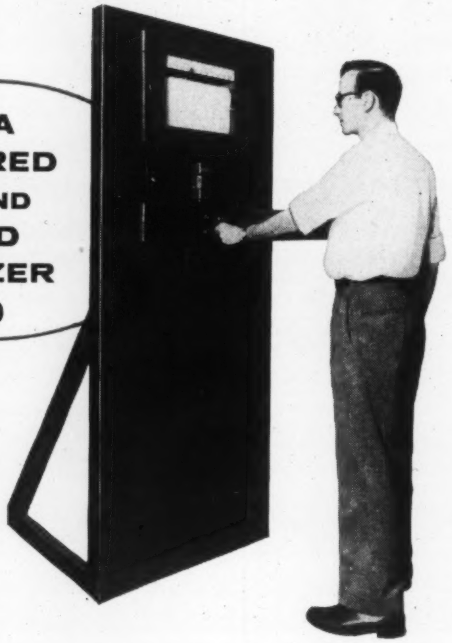
M·S·A OXYGEN INDICATOR (TYPE C-2)

Designed to continuously measure the oxygen content of industrial atmospheres, this compact, accurate instrument provides a means for improving safety in utility operations, effecting economies as a measure of combustion efficiency, and aiding in the control of pipe line corrosion. To accommodate all applications, the instrument is available in the following scale ranges: 0 to 1.0%, 0 to 5.0%, 0 to 10%, and 0 to 25%.

APPLICATIONS:

- **Hydrogenation Processes**
  0 to 1% Oxygen in Hydrogen
- **Fluid Catalytic Cracking**
  0 to 1% Oxygen in Regenerator Flue Gases
- **Inert Gas Control**
  0 to 1% Oxygen in Inert Gases
- **Combustion Control**
  0 to 1% Oxygen in Flue Gases

Write today for our bulletins, or send along your problem



M·S·A INFRA-RED GAS AND LIQUID ANALYZER (LIRA)

For automatic analysis of fluid mixtures, measurement of toxic contaminants in air, precise process control. This device makes a continuous analysis of one component of a mixture. It is extremely stable and accurate which makes it an ideal unit for production control and research problems.

APPLICATIONS:

- **Ammonia Synthesis**
  Carbon Monoxide—0–5 ppm at 200 psi;
  0–100 ppm at atmospheric pressure
  Carbon Dioxide—0–2 ppm at 200 psi;
  0–50 ppm at atmospheric pressure
- **Ethylene Product**
  Ethylene 95–100%
- **Ethylene Purity**
  Acetylene—0–200 ppm; Ethane—0–½%;
  Methane—0–½%
- **Product Loss Control**
  Propane—0–2% in Hydrocarbon Stream
  Ethylene—0–5% in Hydrocarbon Stream

MSA
SAFETY EQUIPMENT HEADQUARTERS

Call the M.S.A. man on your every safety problem
. . . his job is to help you

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 76 Branch Offices in the United States

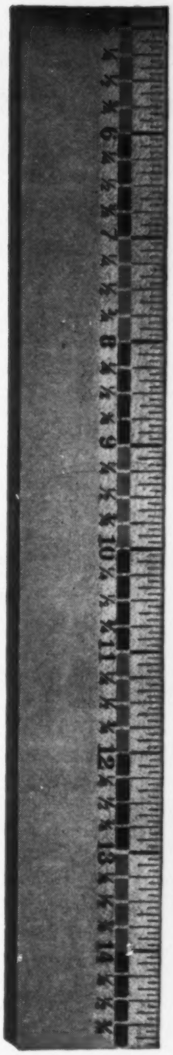
MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver,
Sydney, N.S. • Representatives in Principal Cities
in Mexico, Central and South America
Cable Address: "MINSAF" Pittsburgh

For more information circle **17** on inquiry card.

HOW TO CHOOSE A

SMALL LIGHT RELAY...

from the Automatic Electric line



When there's one *best* miniature relay for a given job, be sure you get it! Select the proper Automatic Electric relay and get peak performance, lower costs.

Painstaking workmanship, rigid quality controls and advanced design features have produced a wide range of performance...fast...sensitive...rugged...with a dependability that meets the stresses and strains of the world's toughest applications. The great demand for these relays makes careful planning worth your while to assure required delivery of the particular relays you need!

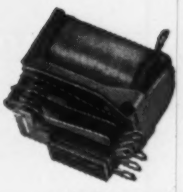
Complete facts and figures on Automatic Electric's Relay line are yours upon request—ask for Circular 1702. Write Automatic Electric Sales Corporation, 1033 W. Van Buren St., Chicago 7, Illinois. In Canada: Automatic Electric Sales (Canada) Ltd., Toronto. *Offices in principal cities.*

RELAYS **SWITCHES**

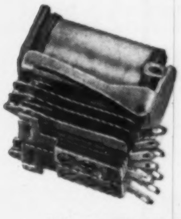
PRODUCTS OF THE INDUSTRIAL DEPARTMENT OF

AUTOMATIC ELECTRIC

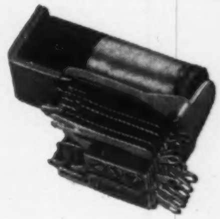
CHICAGO



WHEN SIZE AND WEIGHT ARE LIMITING FACTORS...
Choose this smallest of all Automatic Electric miniature relays. Capacity: 6 contact springs. Weight: 1⅓ oz. Dimensions: 1¹⁷⁄₃₂" x 1⁵⁄₁₆" x ¹¹⁄₁₆". *Specify: Series SQA Relay.*



WHEN GREATER CONTACT SPRING CAPACITY IS REQUIRED...
Choose this double pile-up relay—larger spring capacity in miniature. Capacity: 12 contact springs (up to 18 in some cases, depending upon operating requirements). Weight: 1⅓-2 ozs. Dims.: 1¹⁷⁄₃₂" x 1⅝" x 1". *Specify: Series SQD Relay.*



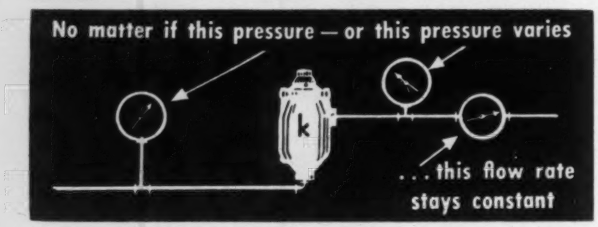
WHEN ADDITIONAL COIL VOLUME IS IMPORTANT...
Choose this relay which accommodates a slug or sleeve for longer release and/or operate time; a second winding for holding, knock down, or separate operation; or greater winding volume for increased sensitivity or greater heat dissipating ability. Capacity: 12-18 contact springs. Weight: 2-4 oz. Dimensions: 2¹⁄₁₆"x1⅝"x1". *Specify: Series SLQ Relay.*

FOR EXTRA SENSITIVITY
The "sensitivity" of a Class "S" Relay can be doubled through the use of oversized coils (⅛" larger diameter than standard coils). For example: under favorable conditions, standard size coils permit operation of 1 Form "C" spring combination at 4 milliamperes, 24 volts dc; similarly oversized coils permit operation at 2 milliamperes, or less.

HERMETICALLY SEALED—SPECIAL MOUNTINGS
Class "S" Relays are available with or without plug mountings. A wide variety of hermetically sealed enclosures are offered for protection of single or multiple relays.

For more information circle 18 on inquiry card.

CUT EQUIPMENT COSTS . . .
CUT PROCESSING COSTS . . .
And INCREASE PRODUCTION


No matter if this pressure — or this pressure varies
k
. . . this flow rate stays constant

. . . BY CONTROLLING LIQUID FLOW THIS SIMPLE WAY with a

Kates Regulator

The installation of a Kates Regulator in the inlet line to a filter . . . to an oil burner nozzle . . . to a deionizer . . . or behind any centrifugal pump, almost instantly results in lower product handling costs and far greater production.

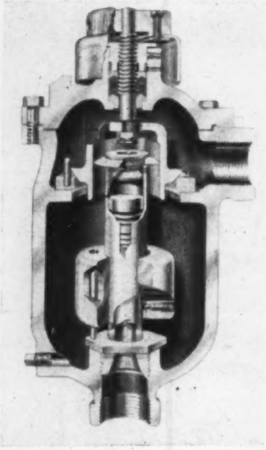
A Kates Regulator smooths out the "ups and downs" in flow rate that occur in almost every liquid handling process. *It is vital in filter pre-coating because it helps to build up a smooth, uniformly dense filter cake—thus assuring longer filtration cycles, finer quality filtration, less costly down-time and greatly reduced filter and requirements. *It is vital in the control of regeneration, backwash or rinse rates where undesirable surges of liquid flow can produce "channeling" or the loss of costly ion-exchange resins. *It is vital in controlling the flow of fuel to a burner where surges of liquid can cause clogging of the nozzle and unnecessary, wasteful distribution of fuel which cannot be efficiently consumed.

In hundreds of other applications, such as blending and proportioning, solvent extraction, chemical process control, diluting of bulk heavy chemicals and evaporator influx a Kates Regulator performs an outstanding, dependable job—simply, accurately, and at low cost.

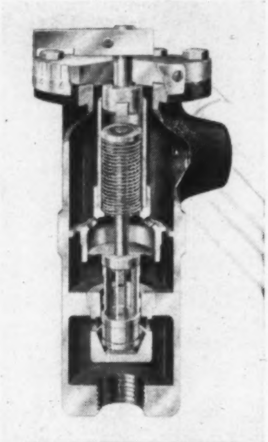
And, when used behind a centrifugal pump, a Kates Regulator provides proportioning control equal to that of much more costly equipment. Learn how adaptable Kates Regulators can be fitted into your liquid control systems—to save you money and do the kind of control job you **want** done.

Contact Your Local Representative or Write Today for Complete Information and Technical Data.

2 Types of Kates Regulators



TYPE GA
for Clear Liquids



TYPE SA
for Liquids and Light Slurries

. . . and how they work:

Both the Type GA and Type SA regulators are simple, self-contained units that are extremely rugged in design. Installed in liquid-handling lines, the Regulators automatically compensate for fluctuation in either their inlet or outlet pressures. A direct-acting valve within the Regulator **automatically** opens or closes to adjust the flow to the pressure change. Thus, the flow of liquid out of the regulator is always smooth and unvarying from the set rate.

TYPE GA

Size	Flow Rating in GPM of Water	Dimensions Pipe Conn.	Approximate Dia.	Approximate Height
0-GA	0.05-0.50,0.10-1.00,0.10-1.50, 0.10-2.00	½"	4¼"	11¼"
2-GA	0.50-6.50, 1.00-12.50	1 "	5¾"	11½"
4-GA	2.00-20.00, 4.00-40.00	1½"	6½"	14½"
5-GA	5.00-50.00, 10.00-100.00	2 "	9½"	19 "

TYPE SA

Size	Flow Rating in GPM of Water	Pipe Connection	Approximate Dia.	Dimensions Height
1 SA	2-10	¾"	3½"	9 "
2 SA	4-20	1 "	4½"	11½"
4 SA	10-50	1½"	6 "	14 "
5 SA	20-100	2 "	8½"	19 "
6 SA	35-175	2½"	9½"	21 "
7 SA	50-275	3 "	10 "	23 "
8 SA	100-550	4 "	13 "	30 "

Standard regulators will hold set point flow within ± 3% for pressure variations up to 125 psi.

"Kates Regulators Never Forget Pressure Changes"

the W. A. Kates co. 430 Waukegan Road, Deerfield, Ill.

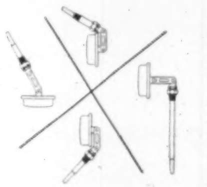
For more information circle **19** on inquiry card.

PALMER a great name in thermometers

PALMER 4½" DIAL THERMOMETER

Adaptable and interchangeable with all Industrial Thermometer applications.

MERCURY-ACTUATED. Guaranteed accuracy. Size: 4½" Dial.

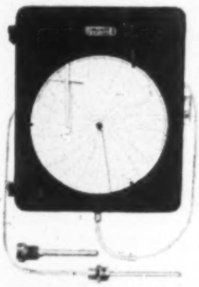


Designed for use as STRAIGHT or any ANGLE. With clear vision all-glass moulded case and metal back. Fittings: Plain, Union, Socket; adjustable or union Flanges.

STANDARD RANGES:

FAHRENHEIT	DIV.	CENTIGRADE	DIV.
−30+130°F.	1°	— 30+ 60°C.	1°
0+150°F.	1°	— 10+ 70°C.	1°
0+240°F.	2°	— 10+120°C.	1°
0+300°F.	2°	— 10+150°C.	1°
0+400°F.	5°	0+220°C.	2°
0+500°F.	5°	0+280°C.	2°
0+600°F.	5°	0+320°C.	2°
+200+750°F.	5°	+100+400°C.	5°
+200+950°F.	5°	+100+500°C.	5°

(Write for Bulletin #51)

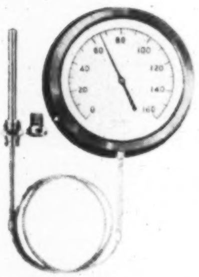


RECORDING and DIAL THERMOMETERS

With Flexible Tubing Connection.

Mercury-actuated, for extreme accuracy. Sturdy construction, very sensitive. All parts rust-proof. Stainless-steel bulb. Wall or Flush Mounting. Bottom or Back connection. Fittings: Plain, Union, Sep. socket; Adj. or Union Flanges.

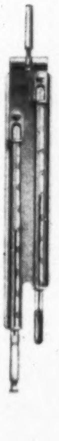
Ranges: −40 to 1000°F. (or C).



RECORDER: 12" die-cast alum. case; Black or white, satin or wrinkle finish; elec. or spring clock; 12 hr., 24 hr., or 7-day charts. One-pen or multiple pens. Also Fully compensated to correct for Ambient Temperature.

DIAL: 6" and 8" round case. Black or white finish. Easy-reading dial.

Bulletin #45



PSYCHROMETER and HYGROMETERS

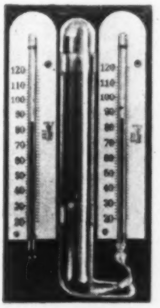
For testing humidity. Chart furnished. Wet and Dry bulb with "Red-Reading-Mercury" lens tube, for easy reading.

Sling Psychrometer—in metal case.

Wall Hygrometer—with water reservoir.

+30+110°F. +80+220°F.

Bulletin #300



INDUSTRIAL THERMOMETERS with "Red-Reading-Mercury"

CASE: 7", 9" or 12" Extruded brass. Wide scale. Chrome finish.

TUBE: Red-Reading-Mercury Easy to Read. Thoroughly annealed for permanent accuracy. Protected by double-strength glass shield. Graduated scale.

FITTINGS: Fixed thrd., Union, Sep. Socket; adjustable or union Flange; parallel thrd. & locknut; special fttgs. to order.

STEM: STRAIGHT and Misc. ANGLES. 3½" to 60", incl. thread.

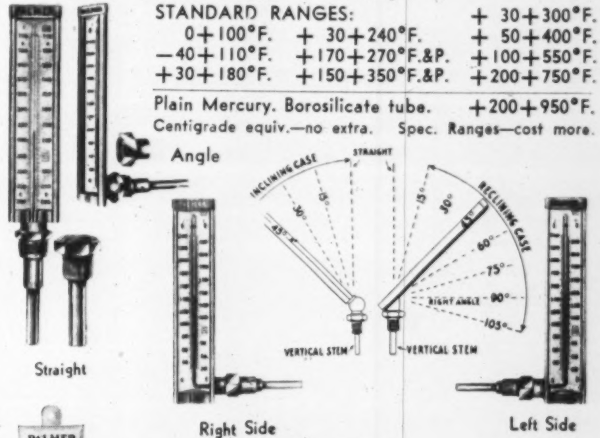
THREAD: ¾" or 1" NPT. (½" not recom.)

STANDARD RANGES:

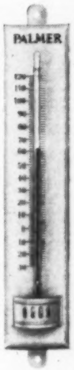
0+100°F.	+ 30+240°F.	+ 30+300°F.
−40+110°F.	+170+270°F.&P.	+ 50+400°F.
+30+180°F.	+150+350°F.&P.	+100+550°F.
		+200+750°F.

Plain Mercury. Borosilicate tube. +200+950°F.

Centigrade equiv.—no extra. Spec. Ranges—cost more.



Bulletin #35



SMALL CASE THERMOMETERS

4" case ⅜" & ½" Fixed Thrd. Fttg.

6" case: ½" & ¾" Sep. Socket Fttg.

Extruded case. Durable Nickel finish.

"Red-Reading-Mercury". Guaranteed accurate.

−30+100°F 2° +30+240°F. 2°.

Bulletin #36

WALL THERMOMETERS

Indoor and outdoor. Very accurate.

12" copper case, with removable Tube and Scale.

10" metal scale, with hangers at top & bottom.

All with lens mercury tube, showing wide RED column.

Bulletin #300

LABORATORY AND PRECISION THERMOMETERS

All glass engraved mercury tube, with vivid RED column. Round or lens; Ring or button top; With or without metal armor; Total or partial Immersion (3" standard). Each in sep. box. All ranges: up to 750°F. (or C. equiv.).

Plain mercury. Borosilicate tube. +200+950°F.

Special ranges & dimensions to order. Fractional division, A.S.T.M. etc.

Annealed and guaranteed very accurate.

5" Pocket Thermometer handy for quick tests.

Write For Bulletin #300

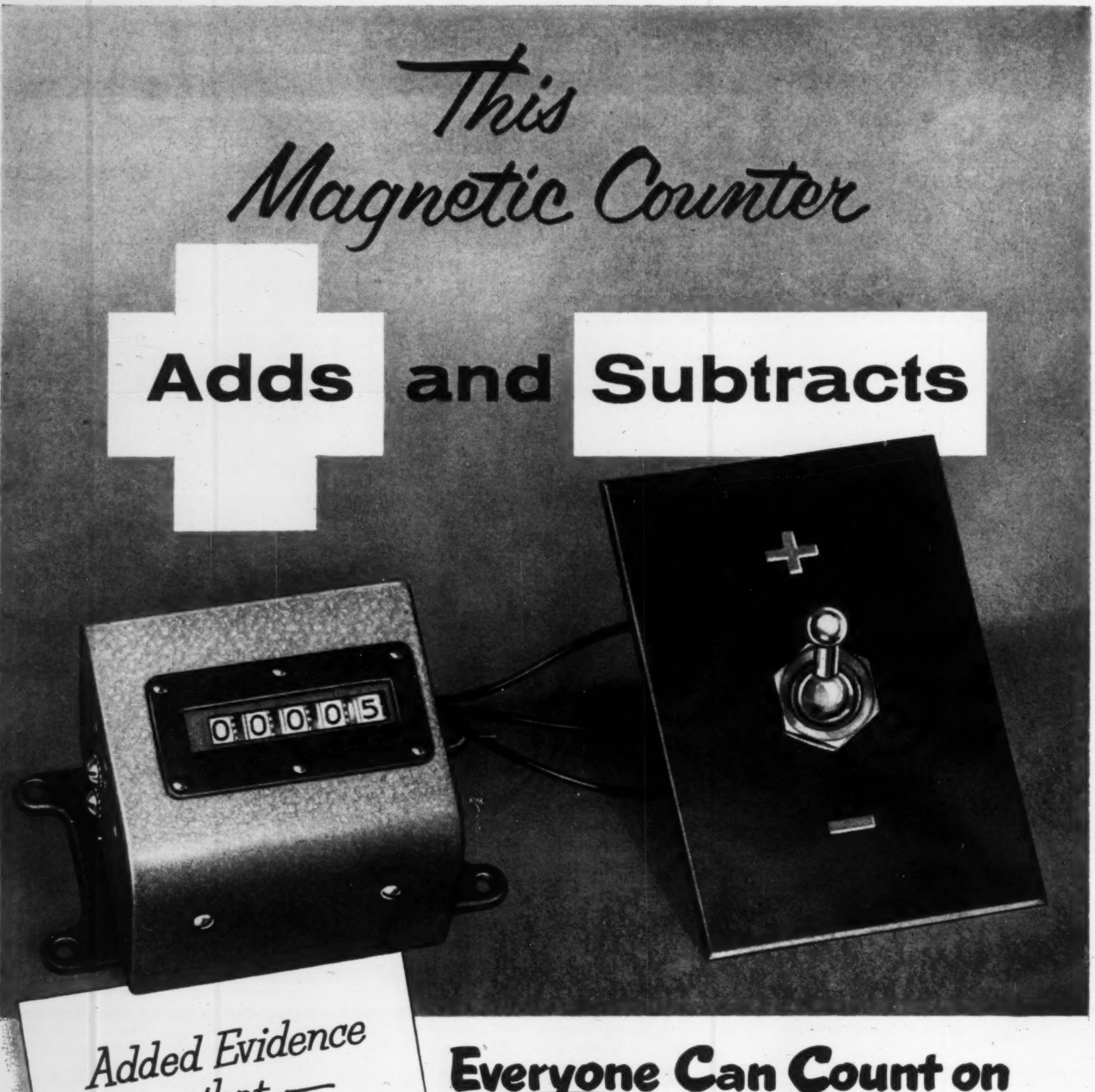
PALMER THERMOMETERS, INC.

Mfrs. of Industrial Laboratory, Recording and Dial Thermometers

2518 NORWOOD AVE., CINCINNATI 12, O.

CANADIAN PLANT: PALMER THERMOMETER LTD., TORONTO, 2

For more information circle 20 on inquiry card.



Added Evidence that —

Everyone Can Count on
VEEDER-ROOT

Flip the switch up . . . the counter adds. Flip it down . . . it *subtracts*. And this 2-way countability makes this new counter a distinct asset to modern systems of automation, control engineering and stock control. Readily adaptable, easily installed and connected to existing circuits, the Veeder-Root "plus or minus" counter is a reliable double-check on the operation of machines, processes, systems. And it's just one of scores of standard and special Veeder-Root Counters for every field of reckoning from atomics to electronics to automation. What is *your* counting problem? Let's put a mathematical eye on it . . . write:

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Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
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Offices and Agents in Principal Cities
"The Name that Counts"

For more information circle **21** on inquiry card.

if it's METAL FABRICATION your FALSTROM MAN has the answer!

Since 1870 Falstrom engineers have been serving America's industry.

For fabrication of large or small shapes to close tolerances—in aluminum, sheet steel, stainless steel, copper, brass and other alloys—complete design-engineering—production service—modern facilities for punching, shearing, bending, welding, finishing . . . ask your Falstrom man—he'll have the answer.

Write for Bulletin 142 or send prints for quotation, without obligation.

FALSTROM COMPANY **90 Falstrom Court, Passaic, N. J.**
PRescott 7-0013 **Since 1870**

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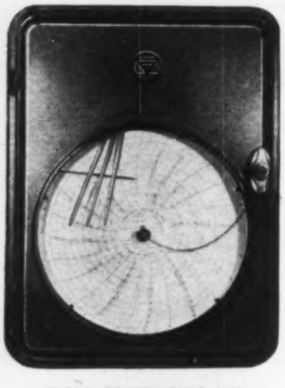
AMERICAN® PRECISION

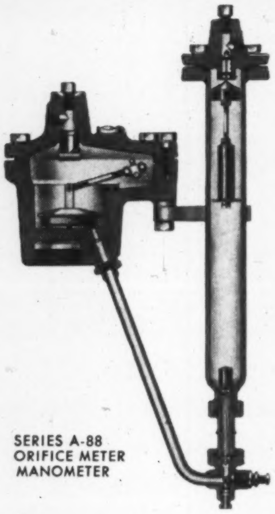
Throughout the world American® job-proven instruments are in service providing accurate, dependable measurement of all types of gases, liquids, steam, water and air. Wherever precision measurement and economy of operation are required . . . at high or low flow rates . . . at varying temperatures . . . whether in recording, indicating, integrating or telemetering models, American precision instruments are synonymous with trouble-free service and low maintenance costs.

Built to the highest standards of quality, American measuring, regulating and testing equipment gives you complete versatility to meet any measurement requirement. The only *complete* line of precision instruments to assure you of "sustained accuracy at lower cost."

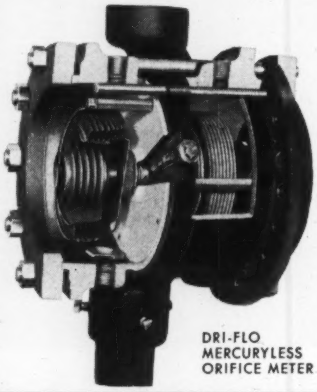
Write today
for full details



FLOW, TEMPERATURE AND PRESSURE RECORDING ORIFICE METER



SERIES A-88 ORIFICE METER MANOMETER



DRI-FLO MERCURYLESS ORIFICE METER

Recording Integrating Indicating

Your specific requirements for accuracy, simplicity and dependability in differential pressure measurement will be met with one of two basic American Orifice Meters — the American Dri-Flo and the American-Westcott Mercury Manometer. Recorders are available with square root or direct reading charts.

American Dri-Flo mercuryless orifice meters provide American-Westcott precision accuracy for applications where mercury manometers are not desired. Available in 20", 50", 100" and 200" ranges, working pressures to 1000 psi., ambient temperatures of—25° to 175° F.

Series A-88 American-Westcott mercury manometers, for working pressures of 1800, 3000 and 5000 psi., feature readily interchangeable high-sides for differential range changes without disturbing manifold piping. American Teflon-Seal Stuffing Boxes prevent leaks, are nearly frictionless and do not require lubrication.

AMERICAN METER CO
EST. 1836
MEASUREMENT ENGINEERS

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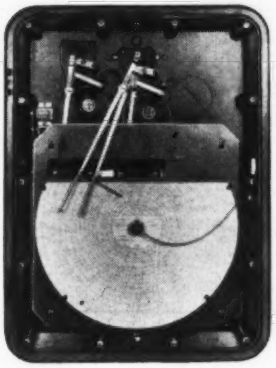
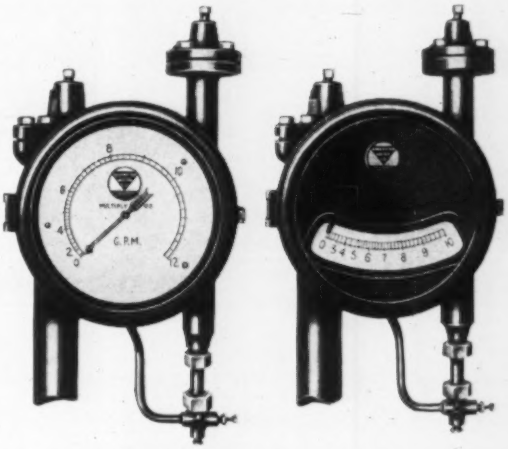
INSTRUMENTS

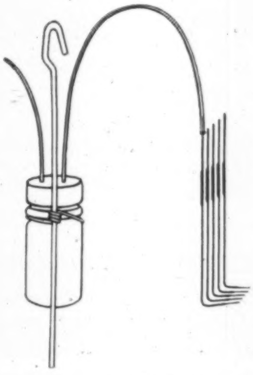
Integrating and Indicating Orifice Meters



Standard American-Westcott Orifice Meters equipped with integrating mechanisms provide totalized indications of the fluid quantities passing through the measuring orifice for all rates of flow or variations in pressure. The instruments integrate for static pressure and differential pressure.

American-Westcott Indicating Meters are available for use where permanent records are not required. The rate of flow is indicated on the dial. Available with Round Dials having a pointer movement of 270 degrees or with Segmental Dials with pointers moving through 45 degrees.



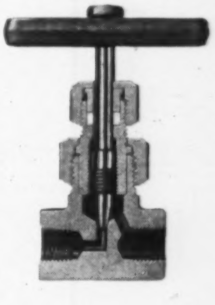


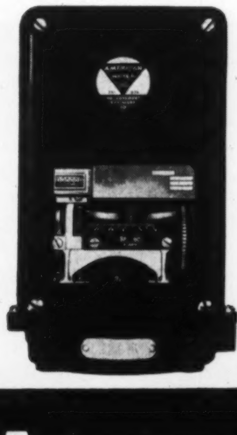
Cannon Meter Pens

Provide maximum legibility and reduce inking problems to a minimum. Half-ounce reservoir holds and protects up to a year's supply of ink. Readings unaffected by pulsating flows, rapid pen movement or atmospheric fluctuations. Stainless steel non-clogging pens available in styles for all standard recording instruments.

Teflon-Packed Needle Valves

Specially designed for lasting, dependable service under the most severe field conditions... virtually eliminate gland leakage. Design rated for working pressures up to 5000 psi. at 70° F. Specially tested valves for pressures to 10,000 psi. available at a nominal extra charge.





Base Pressure Indexes

For use with Ironcase Displacement Meters, these instruments register the total quantity of gas passing through the meter in cubic feet under standard conditions of base pressure. Totalized readings are continuously registered on a straight reading index.

Telecounters

Used in conjunction with American integrating devices, American Telecounters accurately transmit indications of integrated gas quantities, computed to base pressure and temperature conditions, to any remote reading location. Transmission via leased wire, private wire, carrier current, radio wave or microwave.

AMERICAN®
METER COMPANY
INCORPORATED ESTABLISHED 1836

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Pittsburgh · San Francisco · Seattle · Tulsa
IN CANADA: Canadian Meter Company, Limited, Hamilton · Edmonton · Calgary

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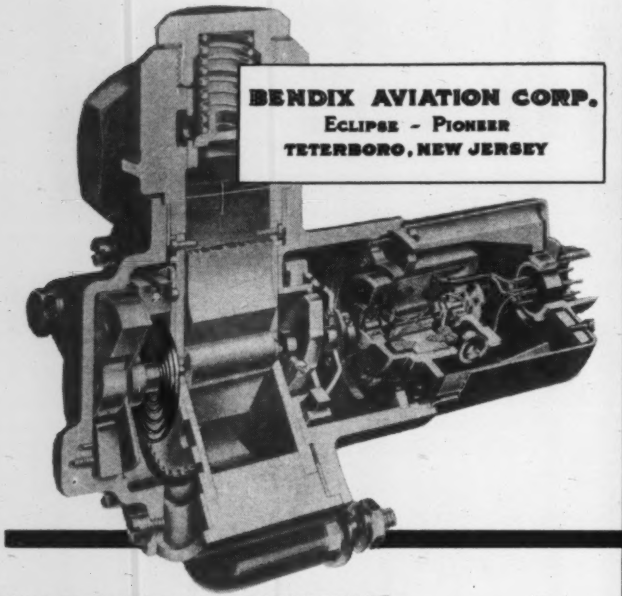
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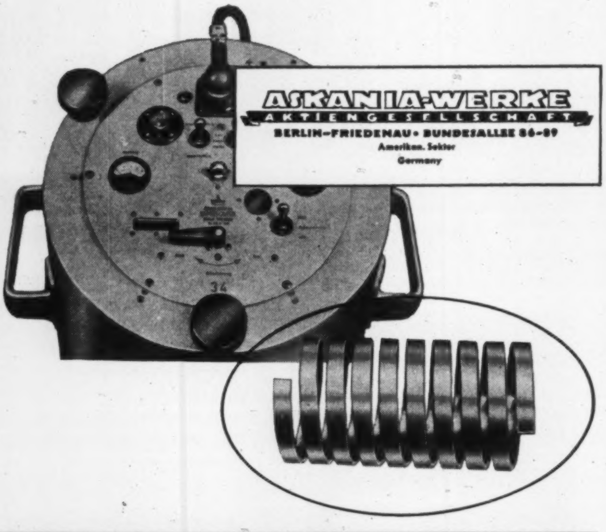
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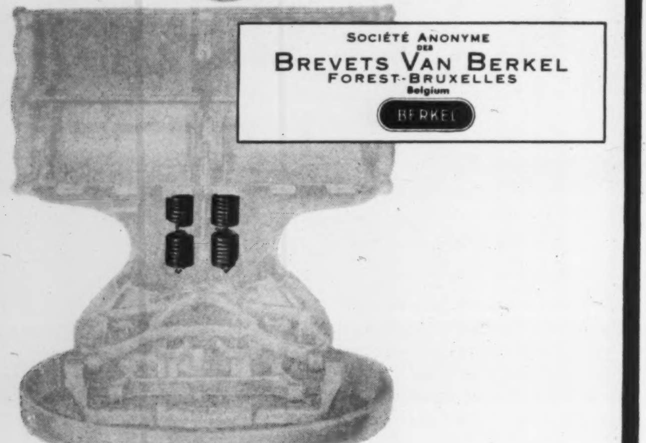
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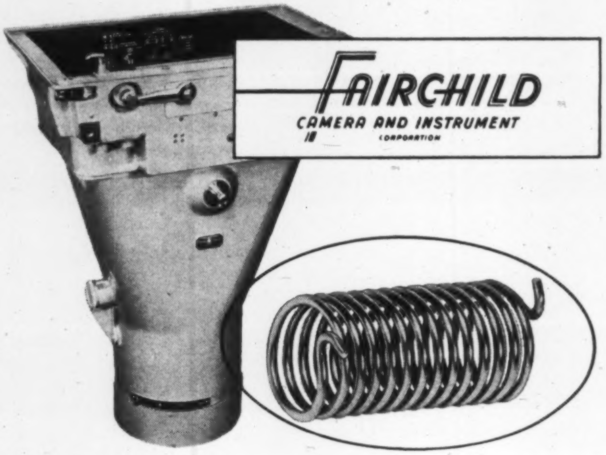
DES
BREVETS VAN BERKEL
FOREST-BRUXELLES
Belgium
BERKEL


FAIRCHILD
CAMERA AND INSTRUMENT
CORPORATION

CHATILLON solves vital spring problems for many of the world's leading instrument manufacturers!

These are but a few of the large and growing number of leading instrument manufacturers who are utilizing Chatillon's extensive know-how to solve spring problems involving the most difficult and rigid specifications.

For example—where ambient temperatures affect instrument accuracy—Chatillon's exclusive temperature-compensated Iso-Elastic* springs are being specified with dramatic success. These springs are virtually unaffected by temperatures ranging from —50° to 150° F.

Other problems involving all types of spiral, torsion, compression and extension springs are likewise being rapidly and economically solved through the application of Chatillon's vast experience in the field.

Contact our engineering department today for assistance in re-designing your springs for greater accuracy, or send us your requirements. Engineering bulletins on Iso-Elastic alloy and springs are available upon request.

*U.S.A. PAT. NO. 2174171

JOHN CHATILLON & SONS

85 Cliff Street, New York, N.Y.
Manufacturer of Precision Springs and Measuring Apparatus Since 1835

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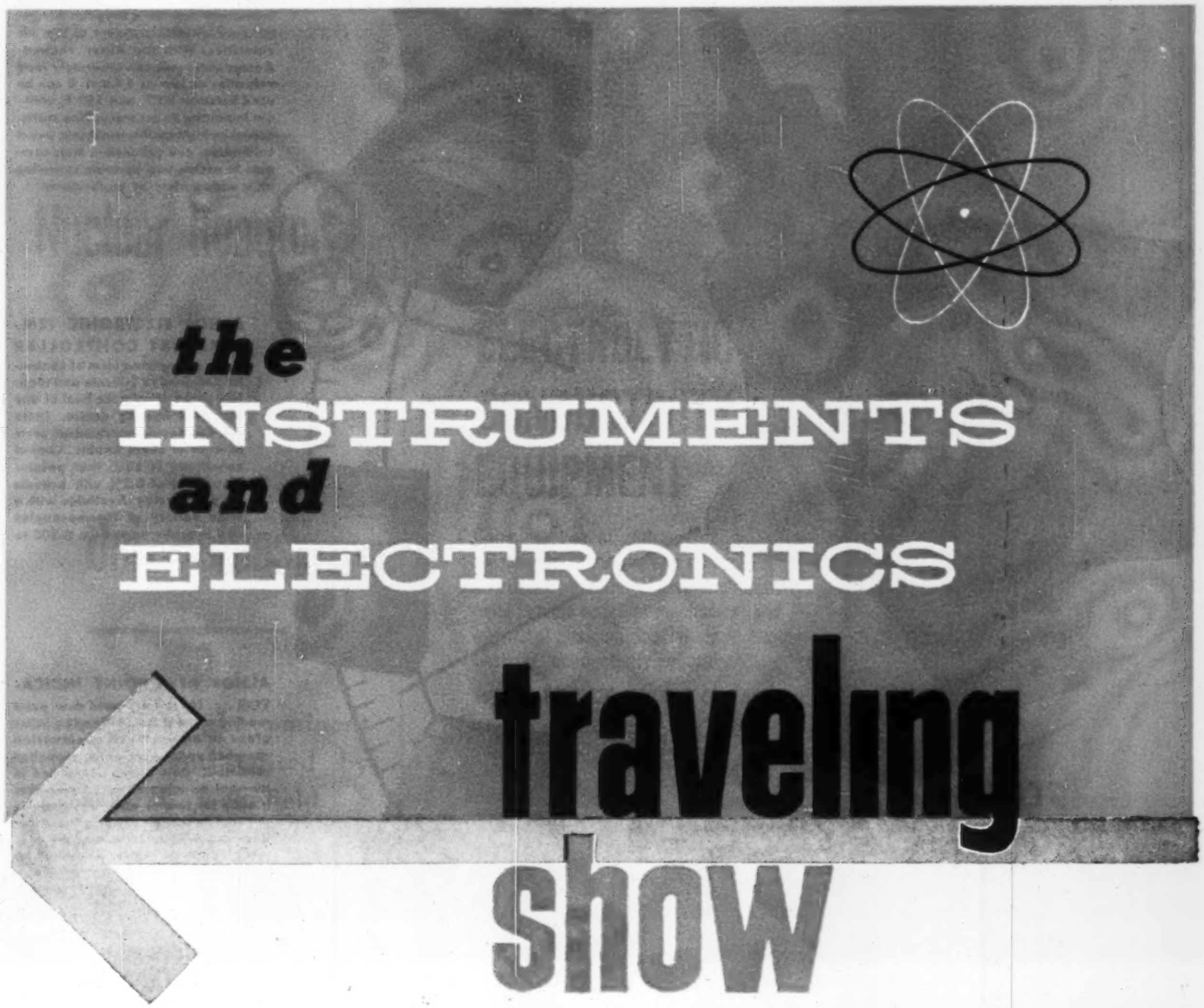


the INSTRUMENTS and ELECTRONICS traveling show

Manufacturers of instruments, automation and electronic devices can display in 30 cities—at a cost of less than $200 per city!

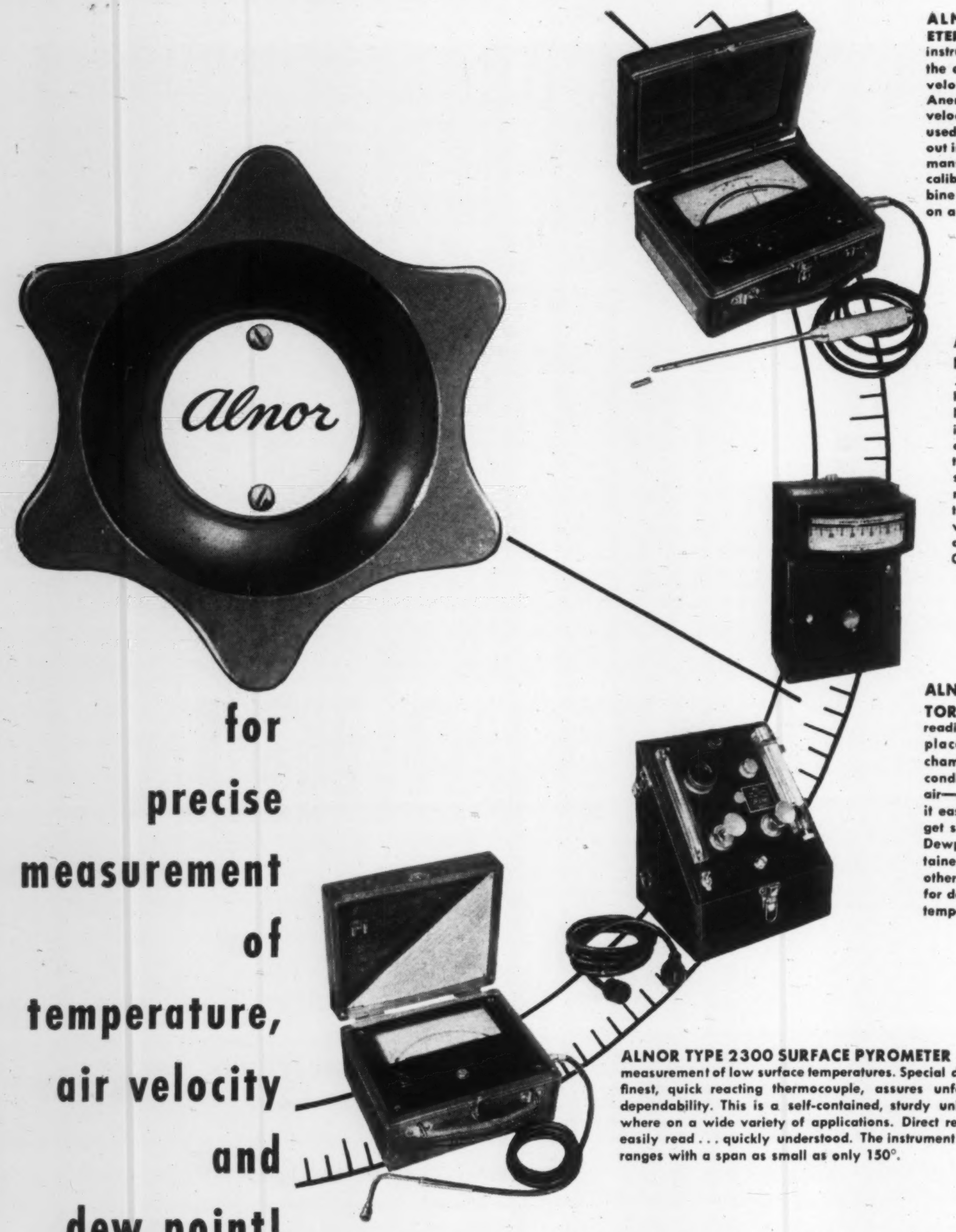
Now, for the first time, the instrument industry will have a means for reaching individuals never before contacted at the national, stationary trade shows.

The Show will move by a specially designed van; thorough and complete show management throughout its travel will be furnished by Richard Rimbach Associates.

Physical requirements will limit participation to 45 exhibit booths. Your prompt reply will guarantee inclusion in The 1956 Instruments and Electronics Traveling Show.

OVER 30 CITIES COAST TO COAST WILL BE ON THE ITINERARY

Write to Richard Rimbach Associates, 845 Ridge Ave., Pittsburgh 12, Pa., or telephone FAirfax 1-9831



ALNOR THERMO-ANEMOMETER Here's a compact, direct-reading instrument that fills a long-felt need—the accurate measurement of low air velocities. With the Alnor Thermo-Anemometer you can accurately read velocities as low as 5 f.p.m. It can be used between 20°F. and 150°F. without impairing its accuracy. Fine craftsmanship, high-quality materials, exact calibration, and exhaustive tests combine to assure you accurate operation on a wide variety of applications.

ALNOR ELECTRONIC TEMPERATURE CONTROLLER . . . is a simplified form of controller designed to indicate and regulate automatically the heat of any industrial heating device. There are no moving mechanical parts to wear or cause trouble. Control sensitivity is such that pointer movement of 0.3% will activate the power relay. Available with a wide variety of thermocouples and in scale range from 0-500 to 0-3000°F.

ALNOR DEW POINT INDICATOR . . . for simple, rapid dew point reading of any gas. Indication takes place in an enclosed observation chamber under accurately controlled conditions. Dew or fog suspended in air—not on mirrored surface—makes it easy for two or more observers to get same accurate results. The Alnor Dewpointer is a complete, self-contained unit—no external coolant or other apparatus is required. Available for dew points from −80° F. to room temperature.

ALNOR TYPE 2300 SURFACE PYROMETER . . . sets a new high in precision measurement of low surface temperatures. Special design, from Alnico magnet to the finest, quick reacting thermocouple, assures unfailing accuracy . . . speed and dependability. This is a self-contained, sturdy unit—easily carried and used anywhere on a wide variety of applications. Direct reading, six-inch mirrored scale is easily read . . . quickly understood. The instrument is available in 5 Fahrenheit scale ranges with a span as small as only 150°.

for precise measurement of temperature, air velocity and dew point!

If your measurement problems involve any of these, choose a precision instrument from the Alnor line. Unexcelled for unfailing accuracy, Alnor instruments have proved their superiority in a broad range of laboratory, production-line and field applications. The units shown are but a few from a full line of rugged precision instruments that have many unique patented features that mean greater accuracy . . . a more practical, trouble-free solution to your measurement problems.

Follow the lead of those who know quality best . . . select Alnor for your laboratory or industrial instrumentation.

Alnor ILLINOIS TESTING LABORATORIES
420 N. LA SALLE ST. • CHICAGO 10, ILL.

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Illinois Testing Laboratories, Inc.
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Send complete information on the following:
☐ Electronic Controller ☐ Dew Point Indicator
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For more information circle 25 on inquiry card.

The first and much-needed book on small research reactors

# Nuclear Reactors
for
Industry
and
Universities

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written by eight eminent authorities and edited by Ernest H. Wakefield

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APPENDIX—Glossary of Terminology, Cloth, 102 pages, photos and diagrams, 4-page index.

$2.00 postpaid

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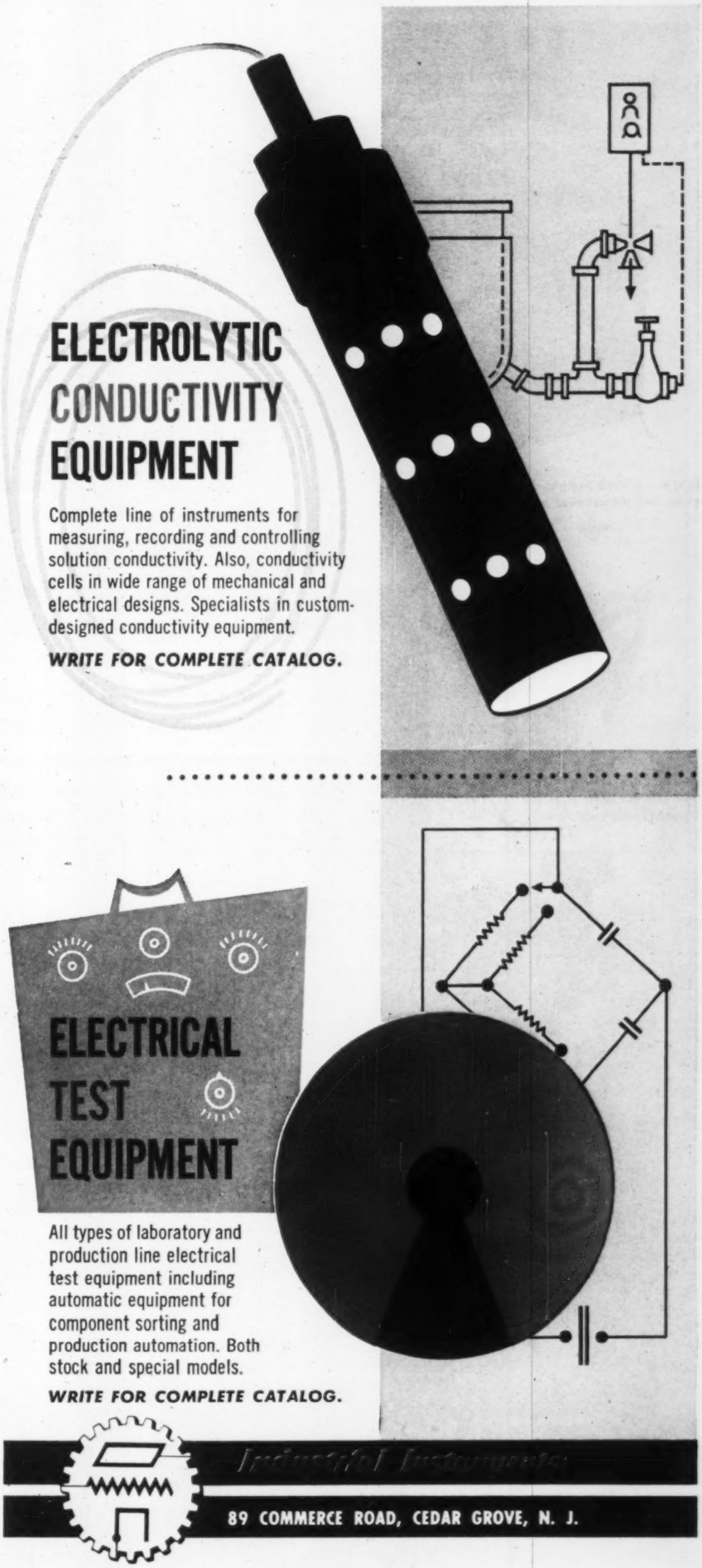


ELECTROLYTIC CONDUCTIVITY EQUIPMENT

Complete line of instruments for measuring, recording and controlling solution conductivity. Also, conductivity cells in wide range of mechanical and electrical designs. Specialists in custom-designed conductivity equipment.

WRITE FOR COMPLETE CATALOG.

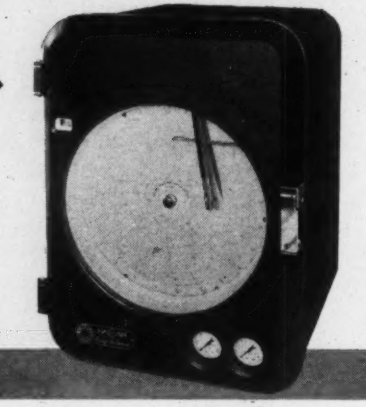
ELECTRICAL TEST EQUIPMENT

All types of laboratory and production line electrical test equipment including automatic equipment for component sorting and production automation. Both stock and special models.

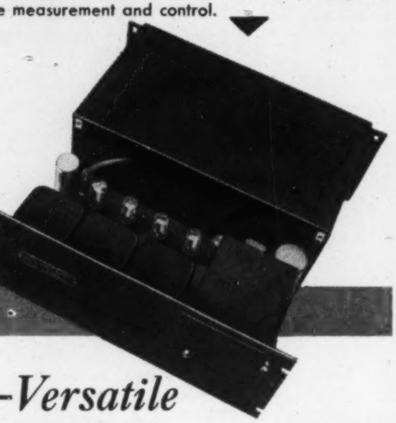
WRITE FOR COMPLETE CATALOG.

Industrial Instruments
89 COMMERCE ROAD, CEDAR GROVE, N. J.

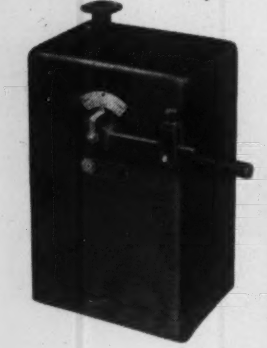
Hagan Ring Balance—Versatile and accurate flow meters for gas or liquids.



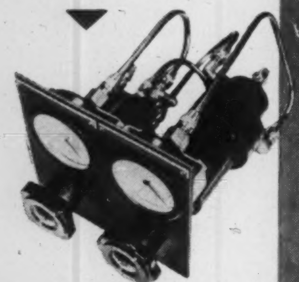
PowrAmp Model "P"—high accuracy (± ¼% of input range) high speed (full scale in 0.1 second) D.C. Amplifier is a versatile instrument for temperature measurement and control.



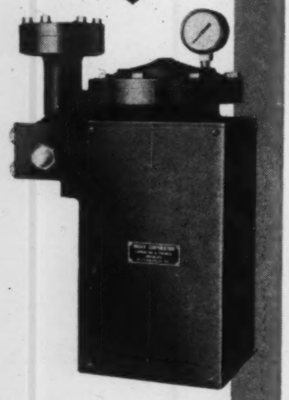
Precision positioning power cylinders in full range of sizes.



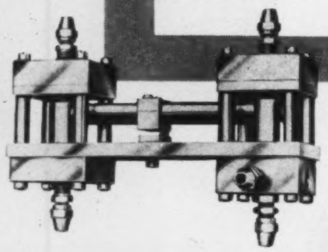
Relays—permit remote manual operation and adjustment of systems.



Hagan Flow signal transmitter, high and low pressure, produce accurate signals linear with flow.



Hagan Ratio Totalizer—adds, subtracts, multiplies, divides, or proportions two or more signals. May also be used as a controller.



Accurate—Dependable—Versatile
INSTRUMENTATION and CONTROL
by HAGAN

Hagan offers the most complete line of integrated control and instrumentation components available. The many Hagan devices may be grouped in the following categories:

SENSING AND MEASURING ELEMENTS

Transducers: pneumatic, electro-pneumatic and electronic for all process variables such as temperature, pressure, flow or electrical quantities. Also, pneumatic load cells and electronic pressure transducers.

Recording and integrating meters and controllers for all process variables. Computing flow meters automatically correcting for variations in pressure, temperature or density, available for static pressures up to 15,000 psig. Also line insertion oil meters and totalizing meter systems.

REGULATORS, RELAYS, COMPUTERS

Pneumatic, hydraulic, electro-pneumatic and electro-hydraulic regulators and computers for industrial processes and high performance servo systems. Automatic gain controllers. Pneumatic Relays, ranging from the simplest compensating type to multi-input computing relays. Complete control panels.

POWER UNITS

A full range of power units include: diaphragm motor, precision positioning type double-acting pneumatic cylinders with from 4″ to 12″ bore and 5″ to 48″ stroke. Hydraulic and electro-hydraulic servo cylinder positioners for pressures to 2,000 psig, hydraulic capacity to 500 gpm.

SPECIALTY VALVES

V-port butterfly gas valves to 14″. Fuel oil control valves.

A phone call or letter to the nearest Hagan office will bring you complete information on these or any one of the many other Hagan units. Call on the Hagan engineer for assistance on your control and instrumentation problems.

HAGAN CORPORATION
HAGAN BUILDING, PITTSBURGH 30, PA.

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For more information circle **27** on inquiry card.

Quick Check List
OF INSTRUMENTS BY FOXBORO
Reg. U. S. Pat. Off.

INDICATORS • RECORDERS • CONTROLLERS

Air Weight

***Conductivity**

***Consistency**

Density (Specific Gravity)
- differential pressure type

Flow
- mercury-manometer type
- "d/p Cell", force-balance transmitter type
- float-and-cable type

Humidity
- wet-and-dry-bulb temperature
- relative humidity (hygroscopic type)
- absolute humidity and dew point temperature ("Dewcel")

Liquid Level or Interface (in open or pressured vessels)
- diaphragm type
- bubble tube (purge) type
- differential pressure type

***Load, Force, and Torque**

***Moisture Content (sheeted materials)**

Motion and Position Recorders

***Motor Load (Power)**

Operation Time Recorders

***Oxidation—Reduction Potential**

***pH (with Beckman glass electrodes)**

Pressure, Absolute Pressure, and Vacuum
- spring and hydron types
- differential type
- *electric pressure cell types

***Resistance (Electric)**

***Speed (R.P.M. or Lineal)**

Temperature
- filled-system types
- resistance bulb ("Dynalog" electronic and galvanometer types)
- thermocouple ("Dynalog" electronic and galvanometer types)

***Tension**

***Thickness (sheeted materials)**

***Viscosity**

***Voltage, Current, Impedance, Dielectric**

***Weight (sheeted materials in process)**

***Weight and Force (strain gauge type)**

**with Dynalog Electronic Instruments*

CONTROLLER TYPES

Pneumatic

Model 40: On-Off
- Proportional
- Proportional with Derivative
- Proportional with Reset ("Stabilog")
- Proportional with Reset and Derivative ("Hyper-Reset")

Consotrol (Console/Graphic Panel Types): in all above control mechanisms except on-off

Model 41: On-Off and Proportional
Circular Case: On-Off and Proportional

Electric

Rotax (rotary contact type)
- On-Off
- Multi-Position

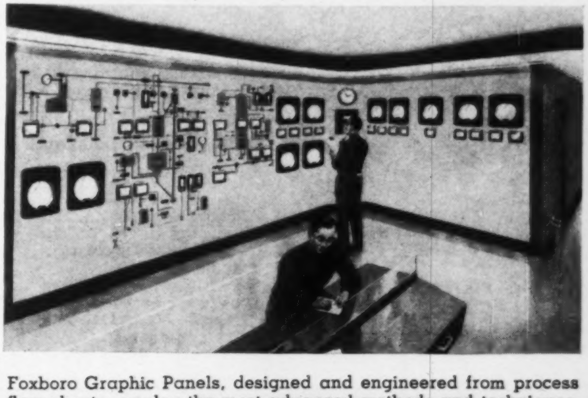
Galvanometer Type
- On-Off
- 2- and 3-position
- Proportioning

CONTROL SYSTEMS

Auto-Selector
Averaging
Dual
Duplex
Limit
Ratio
Relation
Sequence
Time Schedule
(cam and camless types)

CABINET AND PANEL ASSEMBLIES

Any combination of Foxboro Instruments required for precise control of an industrial process is available in a complete pre-engineered cabinet or panel assembly. All instrumentation is expertly connected and integrated at the factory. Installation requires only simple external connections of air and power supply, measurement or transmission lines.



Foxboro Graphic Panels, designed and engineered from process flow sheets, employ the most advanced methods and techniques, assure the utmost in operating efficiency and convenience.

THE FOXBORO COMPANY, 4613 Neponset Ave., Foxboro, Mass., U.S.A.

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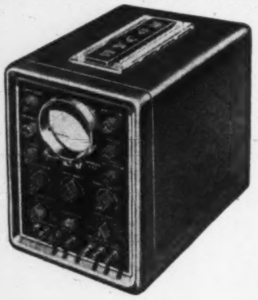
Hycon *. . . where accuracy counts*



MODEL 617

3″ OSCILLOSCOPE

The general purpose scope that gives you most for your dollar... has *flat face* CRT for usable trace edge to edge. It combines laboratory accuracy with ruggedness and compactness that makes it ideal for field service...

VERTICAL AMPLIFIER
Frequency Response: 6 cps to 4.5 mc ±1 db
Sensitivity: .01 v/in rms
Input Impedance: 1 megohm, 35 mmf (±2 mmf) over entire range of attenuator

HORIZONTAL AMPLIFIER
Frequency Response: 6 cps to 500 kc ±3 db
Sensitivity: .075 v/in rms
Input Impedance: 1 megohm

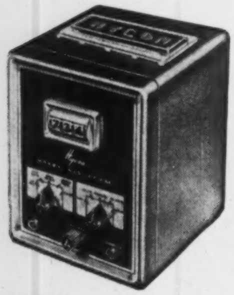
SWEEP RANGES
15 cycles to 100 kc
Television V & H frequencies
60 cycle, variable phase

CALIBRATION
Internal 60 cps square-wave 0.05 to 150 volts peak-to-peak ±5%

SYNCHRONIZATION
Internal, external, positive, negative or AC line

POWER REQUIREMENTS
115 volts, 60 cycles, 100 watts

SIZE . . . WEIGHT
8½″ x 11″ x 10¾″ . . . 22 lbs.



MODEL 615

DIGITAL VTVM

A new dimension in VTVM's... direct, digital readout. Eliminates interpolation and multiple-scale confusion. Illuminated scale with decimal point and polarity sign...

RANGES
DC: 0-1, 10, 100, 1000 volts
AC: 0-10, 100, 1000 volts
Ohms: 0-1k, 10k, 100k, 1 megohm, 10 megohms

INPUT IMPEDANCE
11 megohms

FREQUENCY RESPONSE
Direct Probe: 30 cps – 3 mc
Accessory Crystal Probe: 50 kc – 250 mc

INDICATOR
3-digit illuminated counter

ACCURACY
DC and ohms: 1% . . . AC: 2%

POWER REQUIREMENTS
115 volts, 60 cycles, 30 watts

SIZE . . . WEIGHT
8½″ x 11″ x 7½″ . . . 16 lbs.

Hycon also offers the following advanced test instruments and accessories:

Model 616 Color Bar/Dot Generator • Model 623 3″ DC-Coupled Oscillosynchroscope • Model 624 3″ Industrial DC-Coupled Oscilloscope • TV Sweep Generator • Model 6211 Oscilloscope Divider Probe • Model 6217 Oscilloscope Demodulator Probe

MODEL 622

5″ OSCILLOSCOPE

A new oscilloscope concept...*automatic triggered sweep.* Simplifies adjustments, makes synchronization positive. Special CRT has flat face for usable trace edge to edge. One of today's most advanced TV servicing aids...

VERTICAL AMPLIFIER
Frequency Response: 6 cps to 6 mc ±3 db; down less than 0.5 db @ 4 mc
Sensitivity: 10 mv rms (28 mv peak-to-peak) per inch
Input Impedance: 1 megohm, 40 mmf (±2 mmf) over entire attenuator range

HORIZONTAL AMPLIFIER
Frequency Response: 1.5 cps to 500 kc ±3 db
Sensitivity: 75 mv rms (210 mv peak-to-peak) per inch
Input Impedance: 100k, 25 mmf

SWEEP CHARACTERISTICS
Usable writing speed . . . 0.03 sec/in to .3 μsec/in
Ranges . . .
- a. 10 cps to 300 kc
- b. Preset V & H television @ 7875 and 30 cps
- c. 60 cps, variable phase line

Type . . . automatic triggered or straight triggered (by switching)

SYNCHRONIZATION
Internal, external, positive, negative or AC line

CALIBRATION
Internal 60 cps square-wave .05 volts peak-to-peak ±3%

POWER REQUIREMENTS
115 volts, 60 cycles, 175 watts

SIZE . . . WEIGHT
13⅝″ x 10½″ x 18¾″ . . . 32 lbs.

MODEL 614

VTVM

Convenience at unprecedented low cost sums up this rugged, serviceable instrument. It's lightweight, versatile. Probes stow inside case, ready for instant use...

RANGES
DC: 0-1.5, 5, 15, 50, 150, 500, 1500 volts
AC: 0-1.5, 5, 15, 50, 150, 500, 1500 volts rms (with associated peak-to-peak scales)
Ohms: 0-1000 megohms in seven ranges

INPUT IMPEDANCE
11 megohms

FREQUENCY RESPONSE
Direct Probe: 30 cps – 3 mc
Crystal Probe: 50 kc – 250 mc

INDICATOR
6½″ meter

ACCURACY
DC and ohms: 3% . . . AC: 5%

POWER REQUIREMENTS
115 volts, 60 cycles, 6 watts

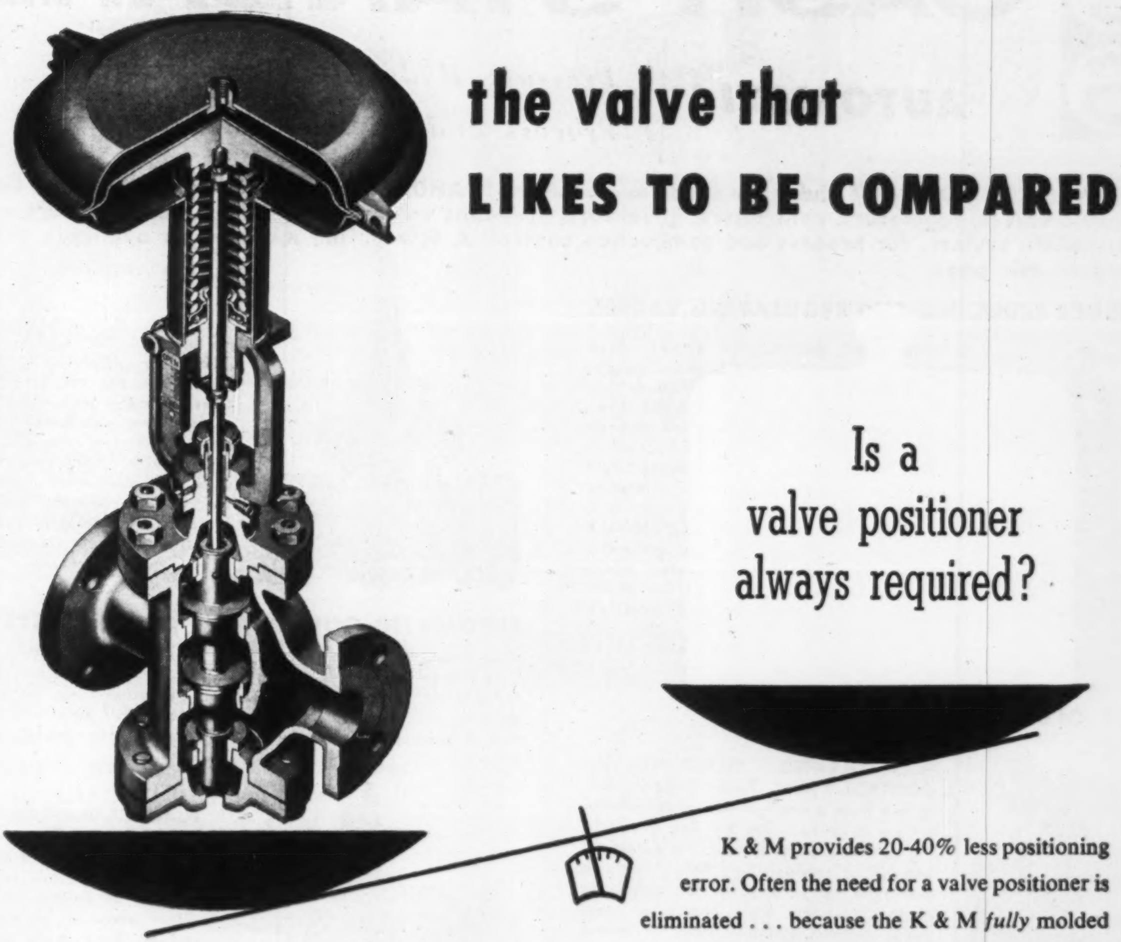
SIZE . . . WEIGHT
8½″ x 11″ x 7½″ . . . 10 lbs.

You can find Hycon electronic test instruments at your local parts jobber.

Hycon Mfg. Company
2961 EAST COLORADO STREET
PASADENA 8, CALIFORNIA

For more information circle **29** on inquiry card.

the valve that
LIKES TO BE COMPARED



Is a valve positioner always required?

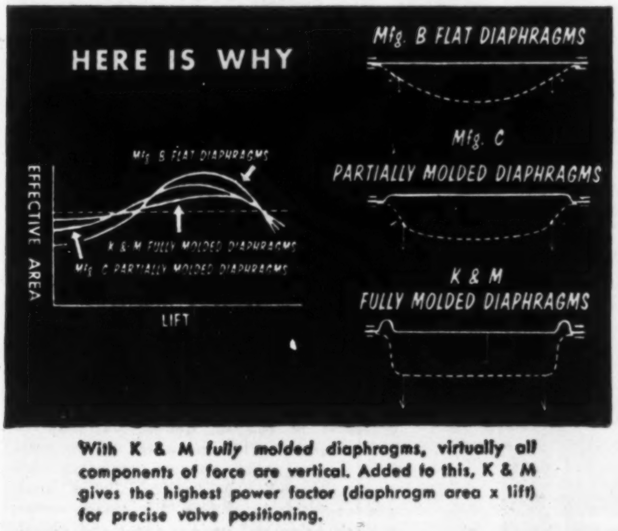
K & M provides 20-40% less positioning error. Often the need for a valve positioner is eliminated . . . because the K & M *fully* molded diaphragm gives the most constant effective diaphragm area.

K & M precision positioning also derives from long stem travel . . . lift that equals or exceeds any comparable valve . . . plus the highest power factor in the industry.

Behind it all lies one fact: K & M Control Valves are not *adapted* to high lift, they are *designed* for it. Throughout the entire range of valve travel . . . positioning is accurate and undistorted . . . control increments are finer with minimized positioning error.

Write for the K & M Valve Data Catalog, Bulletin CV-53.

77th Anniversary . . . Oldest U. S. Pressure and Level Control Valve Manufacturer



With K & M *fully* molded diaphragms, virtually all components of force are vertical. Added to this, K & M gives the highest power factor (diaphragm area x lift) for precise valve positioning.

diaphragm control valves

KIELEY & MUELLER, INC.
64 GENUNG STREET, MIDDLETOWN, NEW YORK

K&M

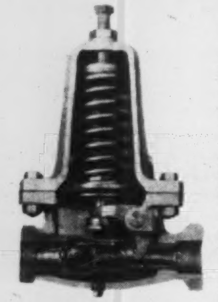
For more information circle 30 on inquiry card.

CASH STANDARD

AUTOMATIC *Pressure, Hydraulic, Temperature, Process and Combustion Controls*

The A. W. CASH COMPANY under the trade mark CASH STANDARD manufactures a complete line of automatic valves, regulators, controllers, governors, hydraulic valves, refrigeration back pressure valves and complete systems for process and combustion control. A few of the many items available are described on this page.

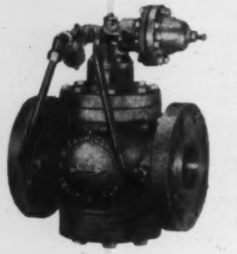
PRESSURE REDUCING AND REGULATING VALVES



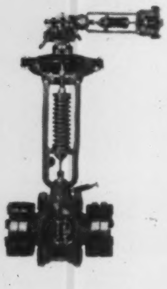
STREAMLINED REDUCING VALVE, Type 1000. Three principles used in this regulator assure high capacity and close pressure control: a streamlined inner valve which eliminates turbulence; straight-line flow through the valve housing; an aspirating effect which controls valve opening by amplifying slight pressure changes into large valve operating forces.

Two types: 1000-HP (illustrated); 1000-LP with larger diaphragm for low pressures. Iron, bronze, steel or stainless steel body; iron, bronze or stainless steel trim. For steam, water, air, oil and most gases and chemicals. Eight sizes from 1/4" x 1/4" to 2" x 2 1/2" with expanded outlet if desired.

PILOT OPERATED VALVES

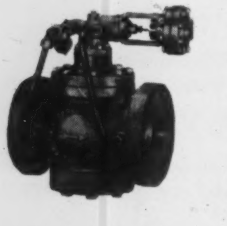


PILOT-OPERATED, SELF-CONTAINED CONTROL VALVE, Type 10. Easily converted from a pressure reducing valve to a back pressure valve by simply switching control piping. Suitable for water, air, gas, oil or refrigerating fluids. Features dial type range selector for stabilizing control pressure. Iron, bronze or steel body; bronze, stainless steel or monel trim. Sizes, 2" to 12" with flanged ends and 2" to 3" with screwed ends.



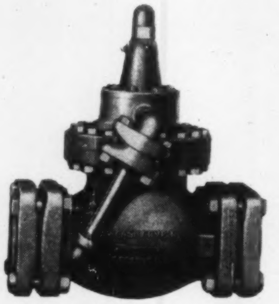
PILOT OPERATED PRESSURE REDUCING VALVE, Type 30-AP. For steam, air and most fluids. Pilot is normally operated by independent fluid. Manner of connecting control lines to pilot and installing reversible inner valve makes this a pressure reducing and regulating valve or a relief or back pressure valve, and determines whether main valve opens or closes with failure of operating fluid delivered to pilot. Air cooled or water cooled packing box. Iron, bronze or steel body; bronze or stainless steel trim. Screwed ends, sizes 1/2" to 3", flanged ends, sizes 1" to 12".

REFRIGERATION EQUIPMENT



CONDENSER WATER REGULATOR, Type 11. Control flow of cooling water to condenser coils and maintain correct condenser pressure. Used to regulate valve inlet pressure in many industrial applications. Self-contained and pilot operated. For water, air, gases and oils and all refrigerating fluids. Iron, bronze, or steel body; bronze, stainless steel or monel trim.

Screwed ends, sizes 2", 2 1/2" and 3"; flanged ends, sizes 2" to 12".

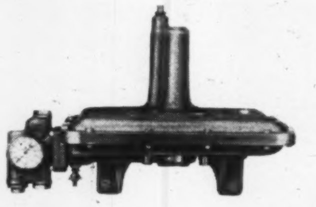


AUXILIARY OPERATED BACK PRESSURE CONTROL VALVE, Type 4030. For refrigeration systems. Normally used with ammonia or freon but also suitable for hydrogen, nitrogen, oxygen, CO_2 and other fluids. Adaptable for use with thermo-air relay controls.

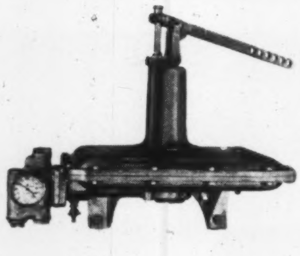
Single seat, flanged ends, sizes 1" to 8"; screwed ends, sizes 1" to 2". Double seat, flanged ends, sizes 4" to 8".

AUTOMATIC COMBUSTION CONTROL SYSTEMS

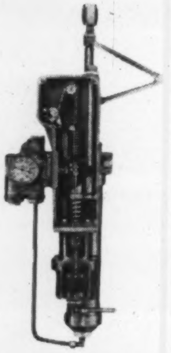
Cash Standard Systems are for use on all kinds of boilers, whether forced draft or natural draft, for all types of stokers and burners, and for coal, powdered coal, gas, oil and other fuels. All elements entering into efficient combustion are controlled automatically, and rate of combustion is regulated to keep pace with changes in steam demand.



FURNACE DRAFT CONTROLLER, Type 90. Operates a remotely installed hydraulic cylinder, normally regulating damper on forced draft jobs; either alone or as part of a system. Extremely sensitive; fully automatic; no packing or gasometer.



AIR-FLOW CONTROLLER, Type 95. Works in conjunction with Type 100 in maintaining proper flow of air to the combustion chamber with respect to rate of combustion, automatically compensating for such variables as fuel bed resistance, fan speed variation, number of boilers or number of fans in service.



SUPER SENSITIVE AUTOMATIC CONTROLLER, Type 100. Double-acting, with four-way valves. Used to operate balanced valves, chronometer valves, butterfly valves of all sizes, and to control fans and other motor driven apparatus. For vacuum and pressures to 600 lb. gauge. Designed to reduce and regulate pressure, relieve pressure, control back pressure, maintain constant differential pressure or liquid level, and control rate of flow. For steam, water, air, salt brine and various gases and chemicals.

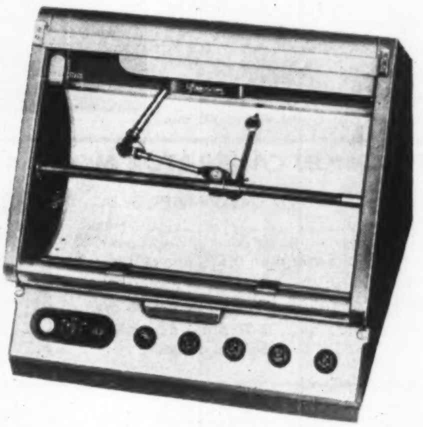
Six sizes of power cylinder employed in many different models for a wide variety of uses.

A. W. CASH COMPANY

P. O. BOX 551 **DECATUR, ILLINOIS**

For more information circle **31** on inquiry card.

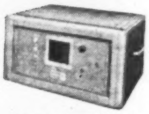
COMPUTERS
CONTROLS
COMPONENTS
BY LIBRASCOPE



X-Y PLOTTER AND RECORDER

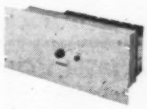
A compact desk or rack-mounted instrument for recording two independent variables on standard graph paper. Two basic input sections allow continuous curve recording from low level D.C. signals with essentially infinite input impedance, or point by point plotting from a variety of digital inputs. Special inputs to meet customer applications are available.

INPUTS TO PLOTTERS OR FOR OTHER DIGITAL SYSTEMS APPLICATIONS



PUNCHED CARD OR PUNCHED TAPE CONVERTERS
Units available to convert output from IBM Summary Punch or any code from Punched Paper Tape Readers.

DECIMAL KEYBOARDS
For manual insertion of tabulated data.



BINARY CONVERTER
Converts 9 bit, 2 channel data from thyratron buffer storage of parallel digital computers.

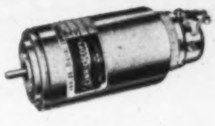
SINE WAVE GENERATOR

Used in frequency syntheses to determine data on transfer functions of automatic control systems and components.

SPECIAL COMPUTERS OR DATA HANDLING EQUIPMENT

Librascope manufactures mechanical and electrical analog computers and digital computers for military and commercial purposes. You are invited to submit your special computer requirements to our engineering staff.

ELECTRONIC COMPONENTS

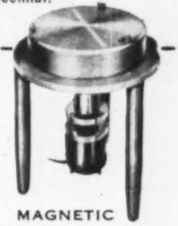


ANALOG-DIGITAL CONVERTERS

A series of shaft position to digital encoders featuring serial/parallel time sharing, non-ambiguous brush systems. The following codes are available: Gray, Binary or Binary-Coded Decimal.

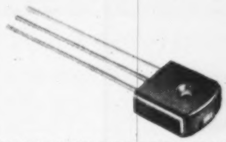
MAGNETIC AMPLIFIERS

Librascope manufactures high performance magnetic amplifiers and transistor magnetic amplifier combinations for industrial servo-controls, analog and digital computers and servo-stabilization networks.



MAGNETIC LABORATORY DRUMS

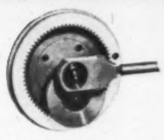
A 5" diameter drum with provisions for eight channels. Includes two machined clocks. Packing density up to 150 bits per inch. Variable speed motor, heads and adjustable mounts included. Special drums to meet your specifications.



READ AND RECORD HEADS

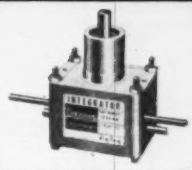
For recording or reading of magnetic drum memory systems in digital computers. High read-back signal, low noise factor. Many models.

MECHANICAL COMPONENTS



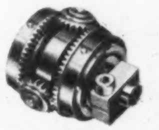
SINE-COSINE MECHANISM

Self-contained unit converts angular rotation into linear sine and cosine movements or solves many trigonometric functions.



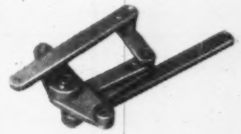
BALL & DISC INTEGRATOR

Precision unit with lifetime lubrication. Used in totalizing, rate determination, differential analysis. Also serves as closed loop servo-element or variable speed drive.



HOLLOW SHAFT DIFFERENTIAL

Precision computer component for measuring angular positions or velocity sums. May be installed or removed without disassembly of unit or differential itself.



LINKAGES

Various linkage computing elements are available, including: addition-subtraction linkages, linkage multipliers and function generators to express exponential, logarithmic and square root functions.

ENGINEERS, PHYSICISTS AND MATHEMATICIANS: For a rewarding career with a company that offers optimum stability with job diversification, write Librascope today. Address inquiries to Mac McKeague, Personnel Director.

For complete catalog information on any of the above products, write:

LIBRASCOPE

A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

LIBRASCOPE, INC. • 808 WESTERN AVENUE • GLENDALE • CALIFORNIA

For more information circle **32** on inquiry card.

BALLANTINE VOLTMETERS

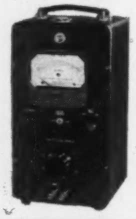
Famous for SENSITIVITY • ACCURACY • STABILITY

AUDIO to 150 kc — MODEL 300

Voltage Range	1mv—100v
Frequency Range	10cps—150kc
Accuracy	2% ENTIRE RANGE
Input Impedance	½ meg shunted by 30μμf

SUB-AUDIO to 150 kc — MODEL 302B

Battery Operated



Voltage Range	100μv—100v
Frequency Range	2cps—150kc
Accuracy	3% 5cps—100kc 5% elsewhere
Input Impedance	2 meg shunted by 15 μμf*

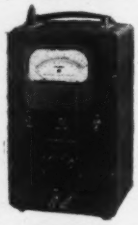
*Shunt capacitance, 8 μμf on all ranges except two most sensitive ranges

PEAK-to-PEAK — MODEL 305

Voltage Range	1mv—1000v pk-to-pk
Frequency Range	10cps—100kc (sine wave)
Pulse width	3μsec—250μsec
Min Rep Rate	20 pulses per sec
Accuracy	5% for pulses
Input Impedance	2 meg shunted by 15 μμf*

*Shunt capacitance, 8 μμf on all ranges except two most sensitive ranges

AUDIO to 2 mc — MODEL 310A



Voltage Range	100 μv—100 v *Down to 40 μv at reduced accuracy*
Frequency Range	10 cps—2 mc *As null detector 5 cps.—4 mc*
Accuracy	3% 10 cps—1 mc 5% elsewhere
Input Impedance	2 meg shunted by 15 μμf*

*Shunt capacitance, 8 μμf on all ranges except two most sensitive ranges

AUDIO to 6 mc — MODEL 314

Voltage Range	1mv—1000v (100μv—1mv without probe)
Frequency Range	15cps—6mc
Accuracy	3% 15cps—3mc 5% elsewhere
Input Impedance	11 meg shunted by 7.5 μμf (1 meg shunted by 25 μμf without probe)

INFRASONIC to 30 kc — MODEL 316

Voltage Range	20 mv—200 v pk-to-pk
Frequency Range	0.05 cps—30 kc *(Down to .01 cps with corrections)*
Accuracy	3% ENTIRE RANGE
Input Impedance	10 meg shunted by 19 μμf or 40 μμf depending on setting

ACCESSORIES are available for all voltmeters to extend voltage measurements down to 20 μv and up to 42.5 kv, and to measure currents from 0.1 μamp to 10 amp, and to provide DC from the Model 300 Voltmeter to drive external recorders or remotely located meters.

TRUE RMS INDICATION — MODEL 320

Voltage Range	100 μv—320 v
Frequency Range	5 cps—500 kc
Accuracy	3% 15 cps—150 kc 5% elsewhere
Stability of Internal Calibrator	0.5%
Input Impedance	10 megs shunted by 25 μμf below 10 mv 10 megs shunted by 8 μμf above 10 mv

DC & AC PRECISION CALIBRATOR MODEL 420

Voltage Range	0-10 v RMS; Pk-to-Pk; or DC
Frequency (Std. Model)	1 kc *(other values on special order)*
Accuracy (long term)	Better than 0.5% above 1 mv
Distortion and Hum	Less than 0.5%
Setting Resolution	Approaches 0.01% above 10 mv
Output Impedance (AC)	2-20 ohms depending on range setting

SENSITIVE INVERTER — MODEL 700

For Measuring DC Voltages when combined with any AC Voltmeter

Voltage Range	1μv—100v DC
Ratios DC Input to RMS Output	1:100 & 10:1
Accuracy	1% 100μv—100v
Input Resistance	>10 meg for 1:100 50 meg for 10:1

DECADE AMPLIFIER — MODEL 220B

For Increasing the Sensitivity of any AC Voltmeter by 10 or 100 times

Voltage Range	10μv—50mv
Frequency Range	10cps—150kc
Accuracy	2% ENTIRE RANGE
Input Impedance	5 meg shunted by 15μμf

EXTRA HIGH VOLTAGE MULTIPLIER — MODEL 620

Usable with all Ballantine Voltmeters and many other types

Peak Voltage	60 kv
Dividing Ratio	10,000 to 1
Accuracy	2%
Frequency (Sine Waves)	60 cps—6 mc
Pulses	0 to 135 μsec duration
Input Capacitance	3.8 μμf

DIRECT READING CAPACITANCE METER MODEL 520

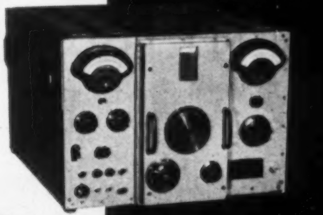
Capacitance Range	0.01 μμf to 12 μf *in 9 decade ranges covering over a billion to 1*
Accuracy	2% above 0.1 μμf 5% below 0.1 μμf
Capacitor Power Factor	0.15
Test Frequency	1 kc

WRITE FOR MORE DETAILED INFORMATION TO—

BALLANTINE LABORATORIES, INC.
112 Fanny Road, Boonton, N. J.

For more information circle **33** on inquiry card.

PACEMAKER IN PRECISION ELECTRONICS...



BJ Hi-Power Standard Signal Generators

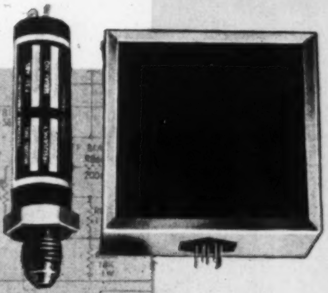
Model BJ-20A offers 10 watts output from 85 kc to 40 mc.

Model BJ-30A provides 5 watts output in the 40 mc to 400 mc range.

BJ

Byron Jackson

Electronic Measurement and Control Equipment



BJ Vibrotron Digital Pressure Gage

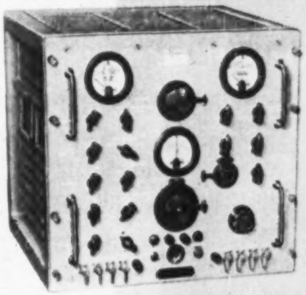
Offered in miniature and subminiature models for direct digital measurement and signaling of pressure, temperature or flow.

BJ Precision Slotted Lines

Laboratory standard precision slotted lines available in three models, with indicator or RF Wattmeter.

More than ten years of leadership in the development and manufacture of precision electronic instruments and gages is demonstrated in this BJ-Rollin line of equipment. Complete technical bulletins are available on these products as well as BJ equipment in the microwave field.

SPECIAL MEASUREMENT PROBLEMS? Our engineers and scientists are ready to work with you in the development of special measuring and testing equipment as well as complete systems.



Multipurpose Signal Generator

A standard signal generator which combines the functions of CW, AM, FM, PM, and sweep.

BJ
SINCE 1872

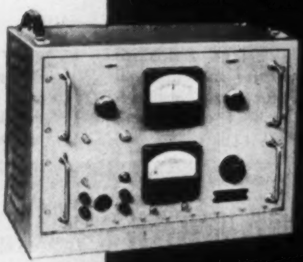
Write or telephone for details:

Byron Jackson Co.

ELECTRONIC DIVISION

Mailing Address: P.O. Box 2017, Terminal Annex
Los Angeles 54, California • Telephone: RYan 1-5166

Visit Byron Jackson Booth No. 1802, Wescon Show—August 24, 25, 26

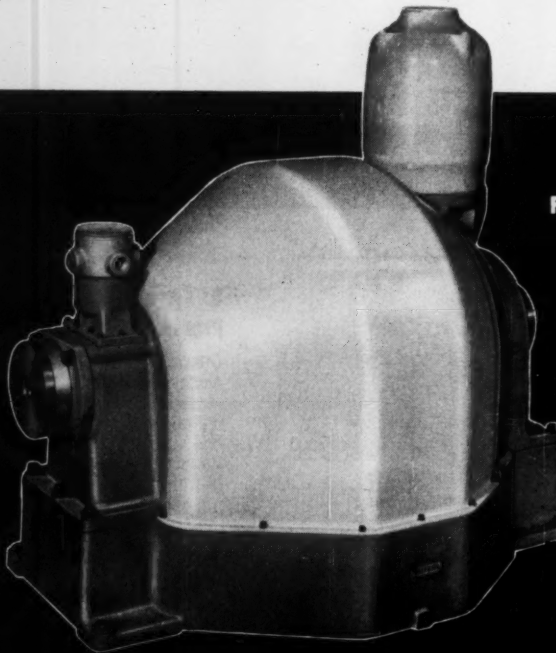


BJ Incidental FM Meter

Measures incidental deviation of a carrier in the presence of AM.

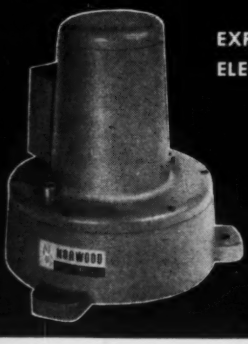
For more information circle **34** on inquiry card.

new techniques IN CONTROL AND MEASUREMENT BY **NORWOOD CONTROLS**



FOR PROCESS CONTROL . . .

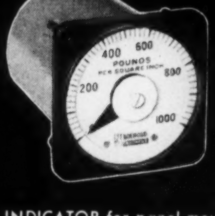
GYRO MASS METER measures — or meters — flowing liquids by weight, not volume. Accuracies are for the first time attainable that meet cost-accounting standards in a variety of continuous flow batching, blending, proportioning, bulk metering and process control applications. Calibration unaffected by fluid viscosity, pressure or density.



EXPLOSION-PROOF ELECTROSYN TRANSMITTERS

for gauge, differential pressure, flow and temperature, with associated magnetic amplifier and null balance indicators. Optional with digital outputs for distant transmission.

PRECISION INDICATOR (.1%)



4" INDICATOR for panel mounting

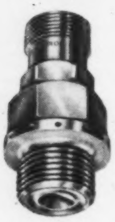
FOR PRECISION TESTING AND EVALUATION . . .

5 AC Pressure Monitor

Combination amplifier and calibrator for use with pressure pickups.

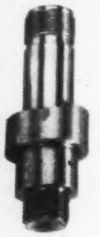
AD Bridge Monitor

Versatile bridge instrument which indicates, calibrates and provides for recording of output of resistive or magnetic transducers.



EPI Engine Pressure Pickup

The recognized standard for accurate dynamic pressure measurement.



EVJ Sparkplug Pressure Pickup

For automotive engine research

EQL Water-cooled Pressure Pickup

For pressure measurements at very high temperatures; rockets, jet engines, etc.

NORWOOD
CONTROLS

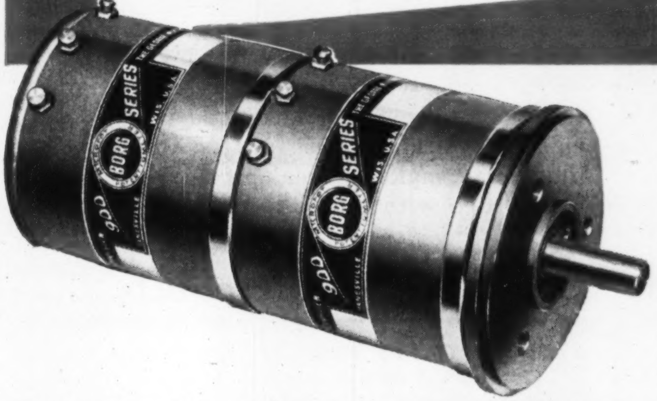
Controls Division
CONTROL ENGINEERING CORPORATION
932 Washington St., Norwood, Mass.
Complete technical information upon request

For more information circle **35** on inquiry card.

"This Is What I Want in a Potentiometer"

1. **Versatility**—A potentiometer to meet a wide field of applications without additional design changes.
2. **Permanent Accuracy**—Resistance element integrally molded within the housing. All leads, taps and terminals firmly encapsulated, permanently locked in place.
3. **Long Life**—Rigid, fixed lead screw to guide contact over resistance element.
4. **Dependability**—A potentiometer that possesses excellent mechanical and electrical stability under extreme environmental conditions.
5. **Absolute Linearity**—A potentiometer with linearity built into it. I don't want to hunt for linearity by trimming.
6. **Specifications**—It must meet my rigid commercial and/or military equipment requirements.
7. **Availability**—I want the model that fits my needs readily available in production quantities.

CHIEF
DESIGN
ENGINEER



BORG 900 SERIES
MICROPOTS

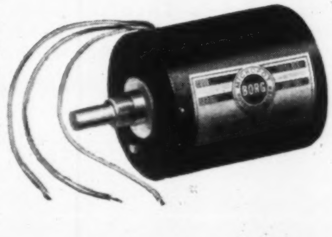
Meet All These Requirements

"It's tops!", that's what design engineers everywhere are saying about the Borg 900 Series Micropots. To meet the tremendous demand Borg has geared production to new high levels assuring you fast delivery of any model in any quantity. All 48 models are available now!

It's no wonder that these pots have had such a tremendous reception for they are truly the "New Standard of Precision Potentiometers". Let us send you engineering data and name of your nearest Borg "Tech-Rep". Write today.

BORG 1100 SERIES MICROPOTS

A precision 10-turn potentiometer that offers your products a price advantage in today's competitive markets. Engineered for easy installation with 9 inch coded leads. Accurate, dependable, long lived.



WRITE FOR
COMPLETE INFORMATION
Ask for Catalog No. BED-A15B

BORG EQUIPMENT DIVISION
THE GEORGE W. BORG CORPORATION
JANESVILLE, WISCONSIN

For more information circle **36** on inquiry card.

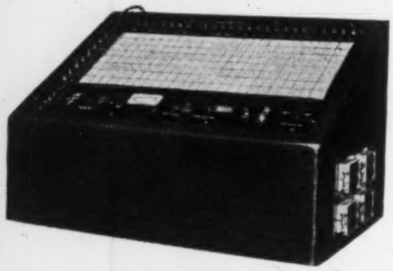
DIT★MCO

TEST EQUIPMENT for

Electrical Circuits ● Complex Relay Systems ● Multiple-Interconnected Circuits

TESTS IN SECONDS!

Model 200-B
Electrical Circuit Analyzer



The Model 200 Circuit Analyzer fully automatic, checks for shorts and opens simultaneously.

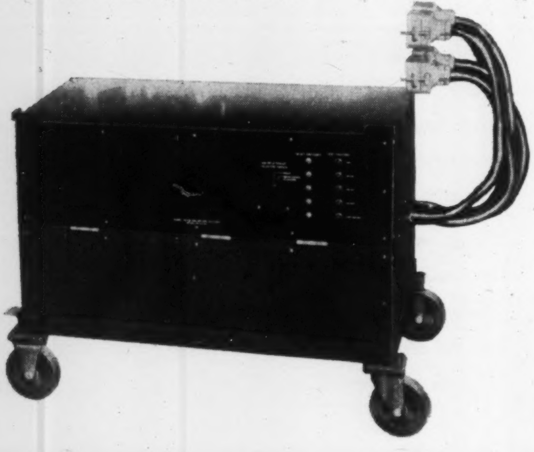
Widely universal, needs no modification to change jobs.

Electronic Detector controls circuit quality consistently to pre-set values.

Exclusive Matrix Reference Chart eliminates manuals, diagrams.

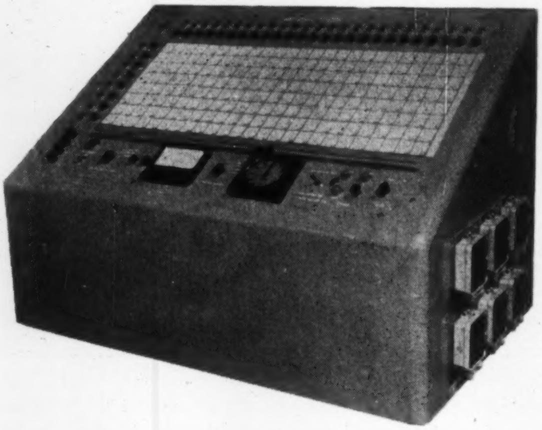
Multiplier Sections

Increased circuit capacities up to 1600 may be added to the Model 200 with various multiplier units.



SPOT TROUBLE INSTANTLY!

With Model 250-F
Functional Tester



A new type analyzer used in testing Control Relay units, where contact resistance of sequencing relays are measured to pre-set values of continuity resistance. The elapsed time delay, make or break, of relay contact is recorded with the built-in special timer.

Other DIT-MCO Products . . .

- **Circuit Testing Analyzers for Complex Cable Systems**
- **Complex Wiring Harnesses, Cables**
- **All Types of Transformers**
- **Drive-in Theatre Equipment**
- **Indoor, Outdoor Theatre Screens**
- **Directional Lighting Equipment**

Send for full details:

Send, TODAY, for descriptive literature.
Submit outline of problem.
Let us help you solve it!

Electronic Division

DIT-MCO, INCORPORATED

505 WEST 9TH STREET
KANSAS CITY, MISSOURI

For more information circle **37** on inquiry card.

AN (STANDARD)

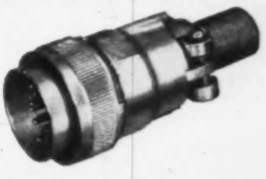
For Aircraft, Electronic Instruments, Military, Industrial, and Commercial Applications

Standard AN-A, AN-B, AN-C... meet Specification MIL-C-5015B. **Plastic inserts.** 15 diameters, 260 insert layouts, 6 shell styles. AN3100 to AN3108 with all accessories. Interchangeability an outstanding feature. Many type assemblies directly available through distributors.

connect with CANNON PLUGS

AN-E (INT. AN-M)

Where Vibration Resistance and Moisture Proofing Are Needed

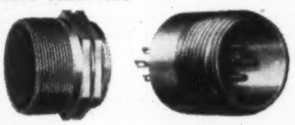


AN-E Series... environment resisting. Replaces "old" AN-M. Meets Specification MIL-C-5015B. Resilient inserts. Completely sealed from cable to cable. Integral clamp and bushing. Grounding lugs. Interfacial sealing with grommet and grommet follower. Available as Interim AN-M with ferrule in place of grommet follower.

The "AN" and associated series connectors offer the

GS (HERMETICALLY-SEALED)

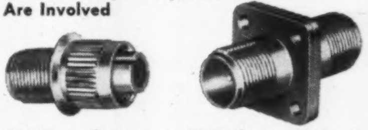
For Use Under Critical Pressure Conditions



Hermetically sealed connectors... with steel shells and contacts to withstand high pressures. Available in GS (AN type), KH, RKH, U, BFH, TBFH. Insulation is Canseal glass material, fused under high temperature to shell and contacts... giving *true hermetic sealing* when soldered or brazed to housing.

STEEL SHELL FIREWALL

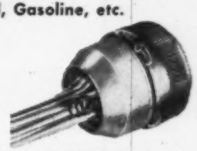
For Open Flame Protection Wherever High Temperatures Are Involved



AN-K and Cannon FW Firewall Connectors... offer you the greatest variety of this type of connector. Cannon made the first firewall connector and continues the leader in the field. Wall—or box-mounting receptacles. Straight or angle 90° plugs. Crimp-on contacts. Inserts of asbestos-filled or glass-filled materials.

CONNECTORS SUITABLE FOR POTTING

For Resistance to Moisture, Fuel Oil, Gasoline, etc.



CA06 and CA3106 Types... developed for the Bu Aer Standard AN3106 type minus the end bell. Special plastic "cups" supplied for use as a mold while potting the rear of the connector. Weight saving. Grounding means available. Plastic or resilient inserts.

widest selection of types for all applications to Spec. "MIL"

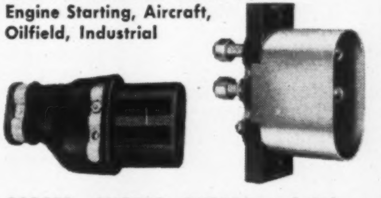
AF, F (VIBRATION PROOF)

For Points of High Vibration Where Extra Strength Is Needed

Vibration Proof CA310*F—CAO*AF Solid Shell, Resilient Insert Connectors... Feature extra strong coupling nuts... in hex, spline, knurled types for airline use. In wall—or box-mounting, cord-connecting type receptacles. Straight or angle 90° plugs.

AN EXTERNAL POWER

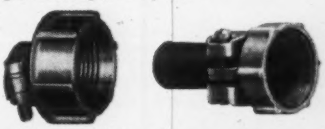
Power Connections—Batteries, Engine Starting, Aircraft, Oilfield, Industrial



CA2551, AN2552, AN3114 and Other Cannon Types Offer Most Complete and Varied Line... in single, double, and three contact fittings. Really rugged! Designed and built for safe, positive connection and long-lasting service.

AN ACCESSORIES

Cable Clamps, Conduit Fittings, Dummy Receptacles, Junction Shells, Dust Caps, Bonding Rings, Bushings, Adapters

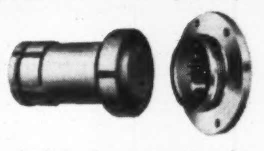


Featuring High-Quality Materials and Workmanship... including AN3057, AN-3057A, AN3420, AN3054, AN3055, AN3056, AN3058, AN3064, AN3066, AN3068, AN3111, 2120, 2245, 17530, 2209, 2182. Adaptable to all makes of AN connectors.

Cannon Plugs—standard of quality for the industry

W

For Underwater and Severe Moisture Conditions



W Waterproof Series... used underwater and on equipment operating in swamps, rivers, lakes, with underground cables — wherever conditions require thoroughly sealed fittings. Exceptionally rugged. AN type inserts. Acme threads on coupling nuts. Special rubber sealing ring. Special heavy duty cable clamp available.

OTHER SERIES... Audio Types–External Power Connectors–Switching Types–dc Solenoids–Guided Missile Launching Connectors–Miniatures and Sub-Miniatures.

40th YEAR 1915-1956

Since 1915

Please refer to this Magazine or to Dept. 419

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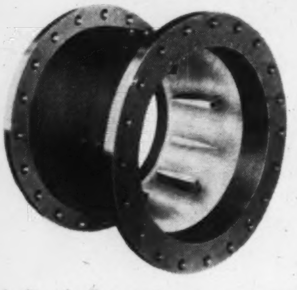
CANNON PLUGS

CANNON ELECTRIC CO., 3209 Humboldt St., Los Angeles 31, Calif. Factories in Los Angeles; East Haven; Toronto, Canada; London, England; Melbourne, Australia. Manufacturing licensees in Paris, France; Tokyo, Japan. Contact our representatives and distributors in all principal cities.

For more information circle 38 on inquiry card.

FOSTER VALVES AND FLOW TUBES
for MEASUREMENT • REGULATION • CONTROL

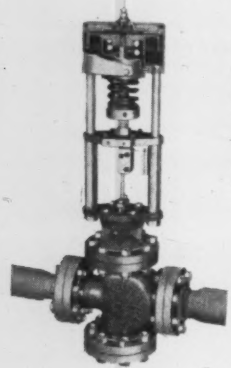


Gentile * FLOW TUBES

The Gentile Flow Tube is an impact-type head meter (differential producer) designed for accurate measurement of fluid flow. Pressure ports are located at sections of equal area so that the differential produced is a function of the velocity head and independent of the static head.

Flow Tubes are short—only about 1 to 1½ diameters long, need no vaults or straight runs except when near valves or regulators, and can be easily installed anywhere in the system most conducive to good results. Lowest head loss for minimum pumping costs. Bulletin FT-101.

*Gen-til'-ly



CONTROL VALVES

The Foster Control Valve with Isoforce Actuator was developed to complete the line of Foster Automatic Valves. Control Valves are now available with same high performance characteristics that Foster Automatic Valves are noted for.

ISOFORCE FEATURES

Constant effective area through entire stroke
Bellofram case diameter absolute minimum
Lightweight actuator
Simplified service and interchangeability
Low distorting forces in any position
Standard superstructure for all sizes
Minimum air volume to position valve

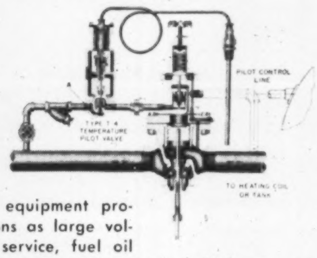
VALVE FEATURES

Higher lift gives added sensitivity
Desired flow characteristic verified by test
Excellent Cv values
Designed to satisfy most exacting specifications
Body design eliminates turbulence pockets
Generous outlet to inlet ratios
Constructed for precise alignment of related parts
ISA Standard face to face dimensions
Indicator shows travel in inches and percent

INTEGRALLY MOUNTED PRESSURE OR TEMPERATURE CONTROLLER
Combines Valve Positioner

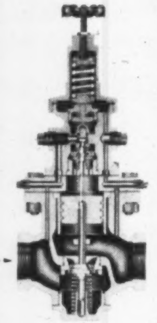
Various pressure and Temperature Ranges
Adjustable throttling range
Remote set optional
Output to 30 PSIG
Scale shows set point
Built to withstand shock and vibration tests

TEMPERATURE REGULATORS

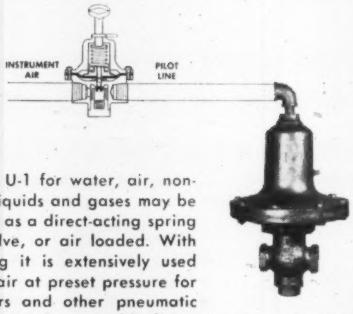


The Foster Type T-10 Combination Temperature and Pressure Regulator consists of a 50-G2 Pressure Regulator with a Type T-4 Temperature Pilot Valve. This combination gives both temperature and pressure supervision for equipment protection in such applications as large volume intermittent heater service, fuel oil heaters, cookers and processing equipment where high pressure steam is used for the heating medium, but final pressure must be low and controlled. Bulletin T-101.

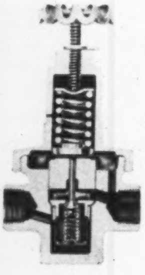
PRESSURE REGULATORS



The Foster 50-G2 Pressure Reducing Regulator for steam pressures up to 1500 psi approaches instrument control. It accurately holds reduced pressure at a steady level — from maximum capacity to tight shut-off — regardless of normal variations in initial pressure. Extremely sensitive throttling action means there is never more than a small, momentary deviation from the set point. Furnished for self-contained operation or remote control. High inlet-to-outlet ratio often eliminates need for a secondary stage valve in supplying low pressure steam. Bulletin G-101.



The Foster U-1 for water, air, non-corrosive liquids and gases may be had either as a direct-acting spring loaded valve, or air loaded. With air loading it is extensively used to supply air at preset pressure for nut runners and other pneumatic tools used on the assembly line, assuring proper torque with no hazard from stalling. Bulletin U-101.



Typical of the Foster Y series, small bore, small capacity valves is the Type Y-24, illustrated, for air, steam, liquids, and gases. Diaphragm type for sensitive regulation with die-forged bronze body and spring chamber. Metal diaphragm and renewable valve seat plug assembly protected with metal strainer. Stainless steel valve. For severe service conditions — sterilizers, unit heaters, cookers, and plastic presses. Bulletin Y-101.

FOSTER ENGINEERING COMPANY

835 LEHIGH AVENUE **UNION, N. J.**

AGENTS IN PRINCIPAL CITIES

AUTOMATIC VALVES • CONTROL VALVES • SAFETY VALVES • FLOW TUBES

For more information circle **39** on inquiry card.

MEASUREMENTS
CORPORATION

Laboratory Standards

Throughout the world, Measurements' reputation for accuracy and reliability is your guarantee of satisfactory service.

STANDARD SIGNAL GENERATOR MODEL 65-B

FREQUENCY RANGE	OUTPUT RANGE	MODULATION
75 Kc.—30 Mc.	0.1 microvolt to 2.2 volts	AM. 0 to 100% 400 cycles or 1000 cycles External mod., 50-10,000 cycles

STANDARD SIGNAL GENERATOR MODEL 78

FREQUENCY RANGE	OUTPUT RANGE	MODULATION
15-25 Mc.; 195-225 Mc. 15-25 Mc.; 90-125 Mc. Other ranges on order	1 to 100,000 microvolts	AM. 8200-400 cycles 625—400 cycles Fixed at approximately 30%

STANDARD SIGNAL GENERATOR MODEL 78-FM

FREQUENCY RANGE	OUTPUT RANGE	MODULATION
86 Mc.—108 Mc.	1 to 100,000 microvolts	Deviation 0-300 Kc. 2 ranges FM. 400-8200 cycles External mod. to 15 Kc.

STANDARD SIGNAL GENERATOR MODEL 80

FREQUENCY RANGE	OUTPUT RANGE	MODULATION
2 Mc.—400 Mc.	0.1 to 100,000 microvolts	AM. 0 to 30% 400 cycles or 1000 cycles External mod., 50-10,000 cycles

STANDARD SIGNAL GENERATOR MODEL 82

FREQUENCY RANGE	OUTPUT RANGE	MODULATION
20 cycles to 200 Kc. 80 Kc. to 50 Mc.	0-50 volts 0.1 microvolt to 1 volt	Continuously variable 0-50% from 20 cycles to 20 Kc.

STANDARD SIGNAL GENERATOR MODEL 84

FREQUENCY RANGE	OUTPUT RANGE	MODULATION
300 Mc.—1000 Mc.	0.1 to 100,000 microvolts	AM. 0 to 30%, 400, 1000, or 2500 cycles. Internal pulse modulator. External mod., 50-30,000 cycles.

STANDARD SIGNAL GENERATOR MODEL 84-TV

FREQUENCY RANGE	OUTPUT RANGE	MODULATION
300 Mc. to 1000 Mc.	Continuously variable from 0.1 microvolt to 1.0 volt	Continuously variable 0 to 30% External modulation 20 to 20,000 cycles.

STANDARD SIGNAL GENERATOR MODEL 90

FREQUENCY RANGE	OUTPUT RANGE	MODULATION
20 Mc.—250 Mc.	0.3 microvolt to 0.1 volt	Continuously variable, 0 to 100% Sinusoidal modulation 30 cycles 5 mc. Composite TV modulation.

PULSE GENERATOR MODEL 79-B

[illegible]UENCY RANGE	PULSE WIDTH	OUTPUT
60 to 100,000 cycles	Continuously variable from 0.5 to 40 microseconds	Approx. 150 v. positive with respect to ground. "Sync Output" 35 v. positive with respect to ground.

SQUARE WAVE GENERATOR MODEL 71

FREQUENCY RANGE	WAVE SHAPE	OUTPUT
Continuously variable 6 to 100,000 cycles	Rise time less than 0.2 microseconds with negligible overshoot	Step attenuator 75, 50, 25, 15, 10, 5 peak volts fixed and 0 to 2.5 volts continuously variable.

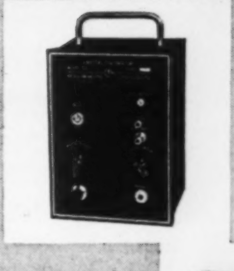
VACUUM TUBE VOLTMETERS

MODEL 62

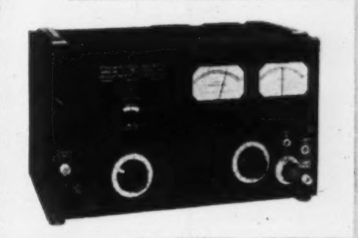
VOLTAGE RANGE	FREQUENCY RANGE	INPUT IMPEDANCE
0-1, 0-3, 0-30 and 0-100 volts AC or DC	30 cycles to over 150 Mc.	Approximately 7 mmfd.

MODEL 67

VOLTAGE RANGE	FREQUENCY RANGE	INPUT IMPEDANCE
.0005 to 300 volts peak-to-peak	5 to 100,000 sine-wave cycles per second	1 megohm shunted by 30 mmfd.



CRYSTAL CALIBRATOR MODEL 111



STANDARD SIGNAL GENERATOR MODEL 80

MEGACYCLE METER MODEL 59

V.H.F. FIELD STRENGTH METER MODEL 58

FREQUENCY RANGE	INPUT VOLTAGE RANGE
15 Mc. to 150 Mc.	1 to 100,000 microvolts in antenna. 1 to 100 microvolts on semi-logarithmic output meter, balanced resistance attenuator with ratios of 10, 100 and 1000 ahead of all tubes.

INTERMODULATION METER MODEL 31

INTERMODULATION RANGE	FREQUENCIES (CYCLES)	ANALYZER INPUT VOLTAGES
3%, 10% and 30% Full scale	LF: 60 cps HF: 3000 cps	Full scale ranges of 3, 10, 30 volts RMS

MEGACYCLE METERS MODELS 59LF—59—59UHF

FREQUENCY RANGE	FREQUENCY ACCURACY	MODULATION
0.1 Mc. to 4.5 Mc. 2.2 Mc. to 400 Mc. 430 Mc. to 940 Mc.	Within ± 2%	CW or 120 cycles fixed at approximately 30%. Provision for external modulation

CRYSTAL CALIBRATORS

MODEL 111

FREQUENCY RANGE	FREQUENCY ACCURACY	HARMONIC RANGE
250 Kc.—1000 Mc.	0.002%	.25 Mc. Oscillator: .25-450 Mc. 1 Mc. Oscillator: 1-600 Mc. 10 Mc. Oscillator: 10-1000 Mc.

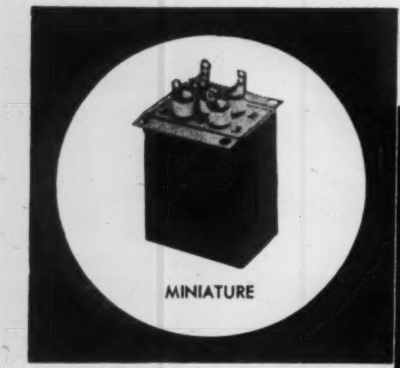
MODEL 111-B

FREQUENCY RANGE	FREQUENCY ACCURACY	HARMONIC RANGE
100 Kc.—1000 Mc.	0.002%	1 Mc. Oscillator: 1 — 450 Mc. 1 Mc. Oscillator: 1 — 600 Mc. 10 Mc. Oscillator: 10 — 1000 Mc.

MEASUREMENTS CORPORATION

BOONTON NEW JERSEY

For more information circle **40** on inquiry card.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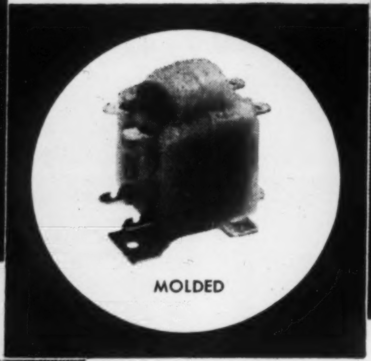
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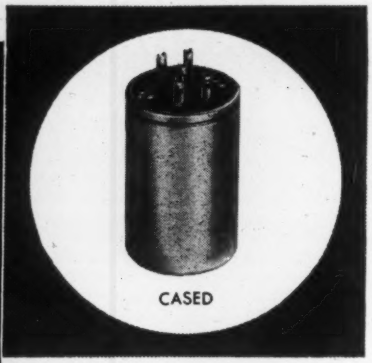

CASED

HERMETICALLY SEALED
OIL-FILLED

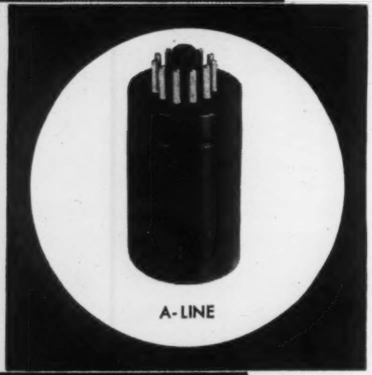
Kenyon
TRANSFORMERS

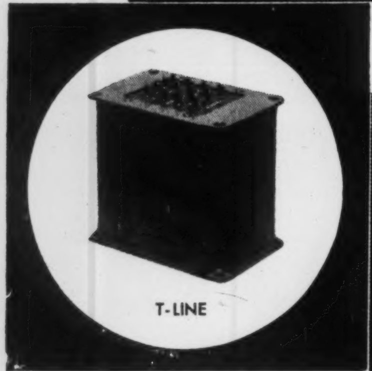
Engineered and Built to Meet the Most Rigid Military and Civilian Requirements

Kenyon's engineering staff and production department have had more than twenty-five years' experience in designing and building units which exactly meet the most rigid and unusual specifications. Your inquiries are invited.

Miniature—Molded—Cased—Hermetically Sealed Oil-Filled—A-Line—T-Line—Toroids—The Kenyon Twins, M-Line to meet all Mil-T-27 Requirements; C-Line for all commercial requirements.

KENYON TRANSFORMER CO., INC.
840 Barry Street, New York 59


A-LINE


T-LINE

TOROIDS

KENYON TWINS

MILITARY COMMERCIAL

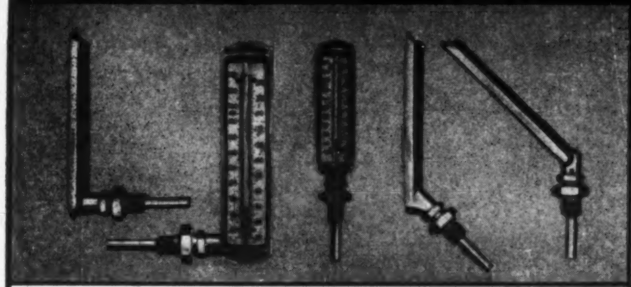
For more information circle **41** on inquiry card.

MOELLER INSTRUMENT COMPANY

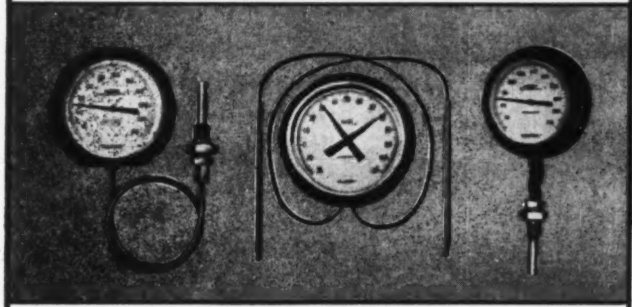
SINCE 1867

132nd STREET & 89th AVENUE, RICHMOND HILL, NEW YORK, N.Y., U.S.A.

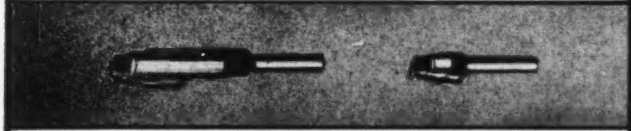
Representatives in Principal Cities



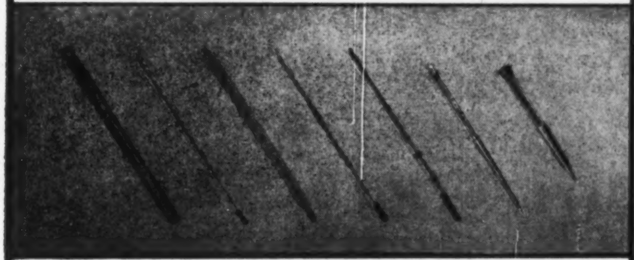
MOELLER INDUSTRIAL THERMOMETERS made in all forms, Straight, Angle, Right Side Angle, Left Side Angle, Reclined and Inclined Angles, in scale ranges from minus 120 to plus 1125°F. or its equivalent in centigrade. Available in 5", 7", 9" and 12" scale sizes with plain stems, union connection stems and separable sockets in all stem lengths and alloys.



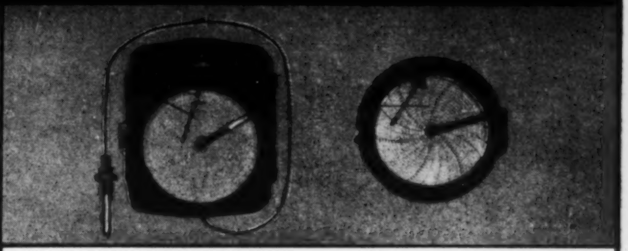
DIAL INDICATING THERMOMETERS, Mercury Actuated, made in 4½", 6" and 8½" sizes with flexible extension tubing. Adjustable rigid stems, single or two pointers, plain bulb, union connection bulb or separable sockets in all lengths and alloys. Scale ranges from minus 40 to plus 1000°F. or its equivalent in centigrade.



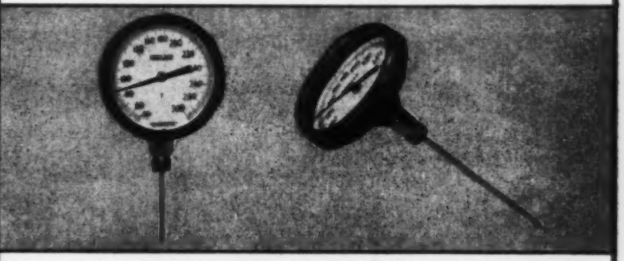
THERMOMETER TEST WELLS, THERMOCOUPLE PROTECTING TUBES and WELLS, made up in all sizes and alloys.



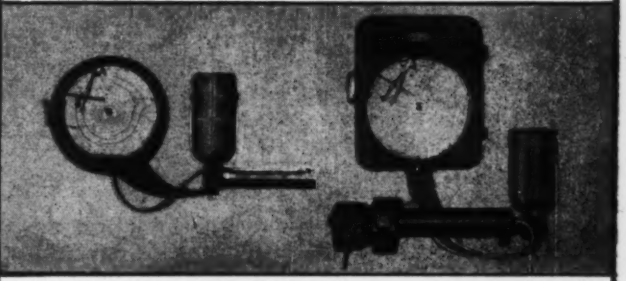
ENGRAVED STEM and PORCELAIN and PAPER SCALE THERMOMETERS made in ranges from minus 150 to plus 1125°F. or its equivalent in centigrade. Available in standard and extreme precision grade. Made to meet specifications of the Government, A.S.T.M. and other authoritative bodies.



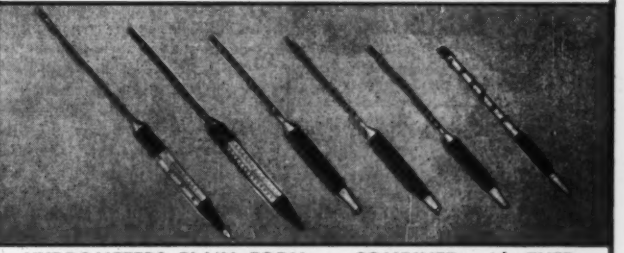
RECORDING THERMOMETERS, Mercury Actuated, made in the round or rectangular cases. Charts 10" or 12", 1 hour, 12 hour, 24 hour or 7 day. Ranges from minus 40 to plus 1000°F. or its equivalent in centigrade. Made in remote reading, direct reading, portable and self contained styles. Plain stems, union connection stems and separable sockets in all stem lengths and alloys.



MOELLER BI-METAL THERMOMETERS are actuated by a powerful, specially processed bi-metal helix. Made in 5" and 3" diameter case size. Rigid stainless steel stem, can be furnished with union connection stem and separable socket in all alloys. Scale ranges from minus 100 to 1000°F or equivalent in centigrade.



RECORDING PSYCHROMETERS, Mercury Actuated. Round and Rectangular Case, 12 hour, 24 hour or 7 day charts, self contained or remote reading, with or without motor driven fan.



HYDROMETERS PLAIN FORM or COMBINED with THERMOMETER. Made in all scales specific Gravity or Baume for heavy and light liquids. Brix, Twaddle, Ballings Scales, etc. available for all liquids. Standard and commercial grades.

For more information circle **42** on inquiry card.

LIQUIDEPTH INDICATORS, INC.

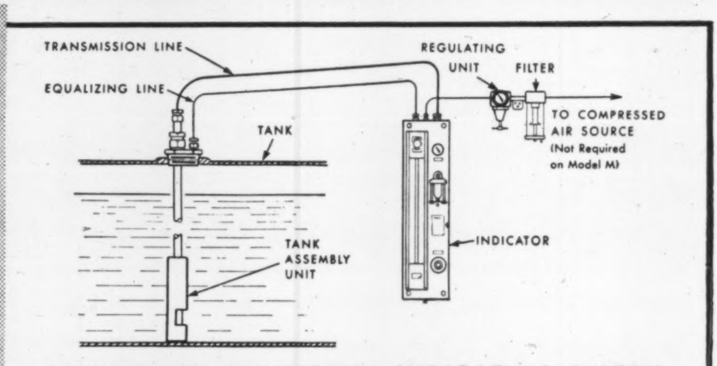
43-22 Tenth St. Long Island City 1, N. Y.
Tel—STillwell 4-3042

Petrometer *Remote Reading* LIQUID DEPTH GAUGES

SERIES 1400

For Accurate, Reliable Measurement of Depth of Liquid in Storage Tanks and Process Vessels. Operates on the principle of hydrostatic pressure... No moving parts... No electrical connections. Gives true reading of contents of tanks above or below the ground.

The Petrometer Industrial Indicating System consists of 5 basic parts: (1) The Indicator, (2) The Tank Assembly Unit, (3) A copper tube transmission line, (4) A copper equalizing line and (5) A manual or automatic source of compressed air for purging the transmission line.



PETROMETER INDUSTRIAL INDICATING SYSTEM

FOUR *NEW* MODELS TO CHOOSE FROM . . .

MODEL 1400 A

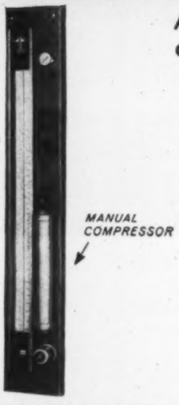
Equipped with aerator valve for semi-automatic indication.

MODEL 1400 B

Equipped with bubbler to give visable evidence of continued aeration. Readings are automatic.

MODEL 1400 F

Equipped with flowmeter in lieu of bubbler.



MODEL 1400 M

Equipped with manual compressor for installations where there is no source of compressed air.

All Petrometer Series 1400 Models, A, B, F and M have these design features:

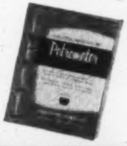
(1) "Sealed In" Indicating Liquid. Cannot spill during transit.

(2) A one-piece extruded aluminum indicating unit with separate channels for scale and window.

(3) All functional parts are contained on the instrument panel — none on the mounting plate or as separate units.

(4) Easy Installation. Simply mount back cover on wall and plug the instrument panel into the female receptacles for quick-lock fastening.

Send For
Bulletin 6004A



All 1400 Models are obtainable in 8 types for different tank depths.

HOW TO SELECT THE *Right* GAUGE . . .

KEY NUMBER	TYPE	INDICATING FLUID
1 to 64	442	RED-X
65 to 96	443	RED-X
97 to 120	444	RED-X
121 to 144	445	RED-X
145 to 164	446	RED-X
165 to 270	552	MERCURY
271 to 410	553	MERCURY
411 to 520	554	MERCURY
521 to 610	555	MERCURY

To determine the right type:

1. Multiply the vertical depth of the tank in inches by the Specific Gravity of the liquid. This result is the key number.
2. Using the key number select the correct type from the table.

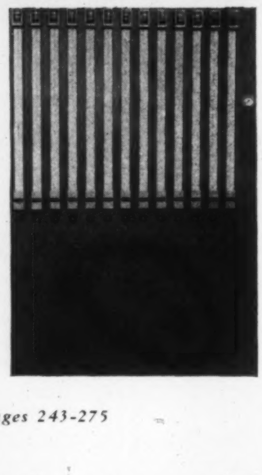
To determine the right model:

1. If compressed air is available select one of 3 models, A, B or F, described above.
2. If no compressed air is available use Model M. Tank assemblies available in brass, stainless steel, Monel, nickel, aluminum, lead, black iron, uscolite plastic. Transmission and Equalizer tubing available in multiples of 10 feet.

MULTI-GAUGE PANEL UNITS

Petrometer Series 1400 Indicators can be obtained in multiple units incorporated on a single panel and mounting plate to meet your specifications. Ideal for central control systems.

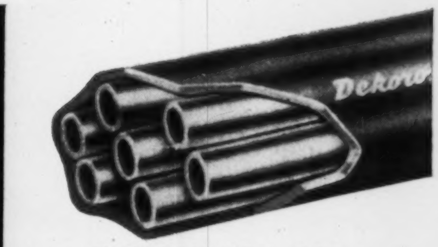
Petrometer Indicating Units, component parts and all accessories can also be purchased separately. ☞



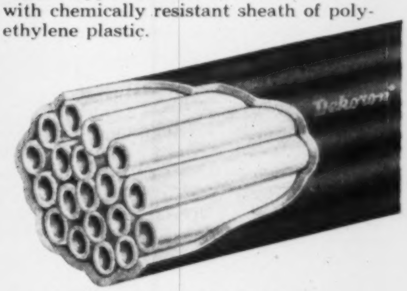
For more information circle 43 on inquiry card.

Dekoron Tubing Products

slash instrumentation costs



DEKORON METL-COR
Instrument line harness of 4, 7 or 10 individual copper or aluminum tubes covered with chemically resistant sheath of polyethylene plastic.

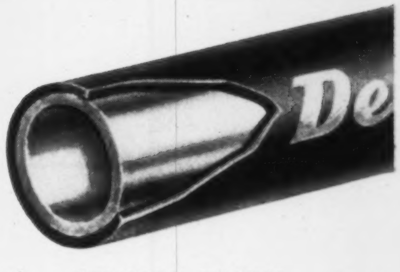


DEKORON POLY-COR
Bundle of 4, 7, 10, 14 or 19 individual polyethylene tubes covered with vinyl plastic. Installs as easily as electric wiring.

DEKORON "M" RIBBON
10 individual copper or aluminum tubes encased in chemically resistant, perforated plastic sheath. One or more tubes can be "peeled" off without special tools.

Dekoron "M" RIBBON

DEKORON "P" RIBBON
Same exclusive ribbon construction as "M" Ribbon except that individual lines are made of color-coded polyethylene. For all standard instrument line pressures.



DEKORON TUBING
The original plastic-coated metal instrument tubing. Available with copper, aluminum or steel core tube. Resists chemical attack, outlasts expensive alloy tubing.

Dekoron "P" tubing
SAMUEL MOORE & CO.
MANTUA, OHIO

DEKORON "P" TUBING
Highest quality single-line polyethylene instrument tubing. Easy to install; requires no special tools.

Dekoron is more than a name for chemically resistant instrument tubing. The Dekoron trademark now identifies a complete line of tubing products—instrument line harness, tubing, fittings, and accessories for tubing up a pneumatic system. Dekoron products cost less to buy . . . less to install . . . last longer. *So tube up with Dekoron products — and watch your costs come tumbling down.*

FITTINGS AND ACCESSORIES
The Dekoron line includes a complete line of fittings for joining lengths of tubing, junction boxes and entry grommets, and Dekoron tubing racks.

Dekoron® products

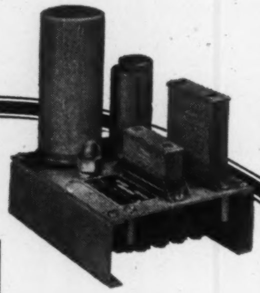
QUALITY • RESEARCH • SERVICE
SAMUEL MOORE & COMPANY
DEKORON PRODUCTS DIVISION • MANTUA, OHIO

AA-1618

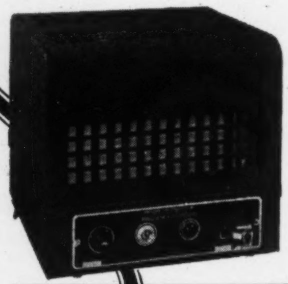
For more information circle **44** on inquiry card.

TYPE 2003
Same as Type 2007 (at right) except Tube 12AT7 and 5 pigtail components are external.

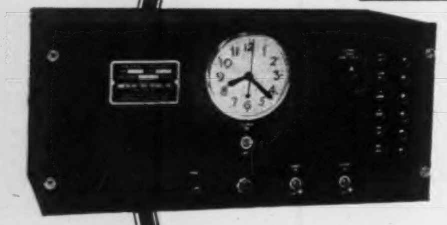
TYPE 2007, BASIC UNIT
Contains shock-mounted fork, double triode and all circuitry. Output, 400 or 500 cycles. Accuracy ± 1 part in 50,000. Octal base container, 1½" x 4½". Weight, 10 oz. Power required, 75 to 200 V.-D.C. at 1 to 5 m.a. and 6.3 V. at 300 m.a. Designed for MIL equipment.



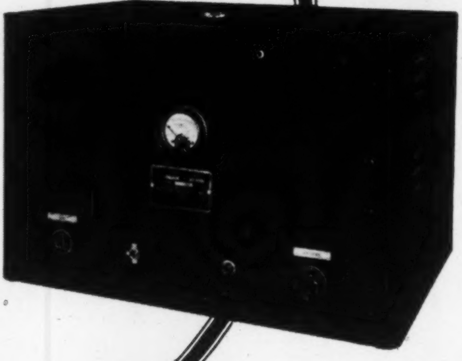
TYPE 2001-2, BASIC UNIT
Frequencies, 200 to 3000 cycles. Dividers and multipliers available for lower and higher frequencies. Output, 6 V.—JAN construction.



TYPE 2005, UTILITY
Provides 10 Watts at 110 V. Precision frequencies from 50 to 500 cycles. Input power, 50 to 500 cycles, 45 Watts.



TYPE 2121-A, LAB. STANDARD
Outputs, 60 cycles, 0-110 Volts, 10 watts; 120-240 cy. impulses. Input, 50-400 cycles, 45 Watts.



TYPE 2111A, POWER UNIT
50 Watt output. 0-110-220 V. at 60 cycles or any frequency 50 to 1000 cycles.

Precision FREQUENCIES

GUARANTEED ACCURACY
1 PART IN 100,000 (.001%)
except where otherwise noted

The basis of these frequency standards is an electronically actuated high-precision fork, temperature-compensated and hermetically sealed against barometric changes. The partial list of uses at the right not only suggests the broad range of applications but also proven dependability where there can be no compromise with accuracy. Please request details by Type No. Our engineers are available for advice or cooperation on related problems.

WIDELY USED IN SUCH FIELDS AS

Aviation, Navigation
Ordnance, Ballistics
High Speed Photography
Viscosity Measurement
Fluid Flow
Nuclear Physics, Telemetering
Chemical Reaction
Radiation Counting
Computers
Facsimile
Fire Control
School and Indl. Research Labs.
Accurate Speed Control

American Time Products, Inc.

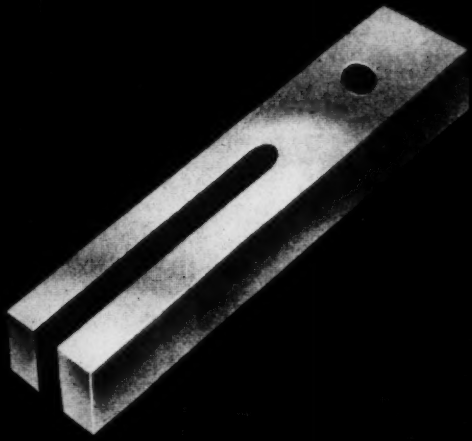
580 Fifth Avenue ***New York 36, N. Y.***

OPERATING UNDER PATENTS OF WESTERN ELECTRIC COMPANY

For more information circle **45** on inquiry card.

Circle **46** on inquiry card. →

Tuning Fork Resonators,
the ultimate in precision audio
frequency control . . .



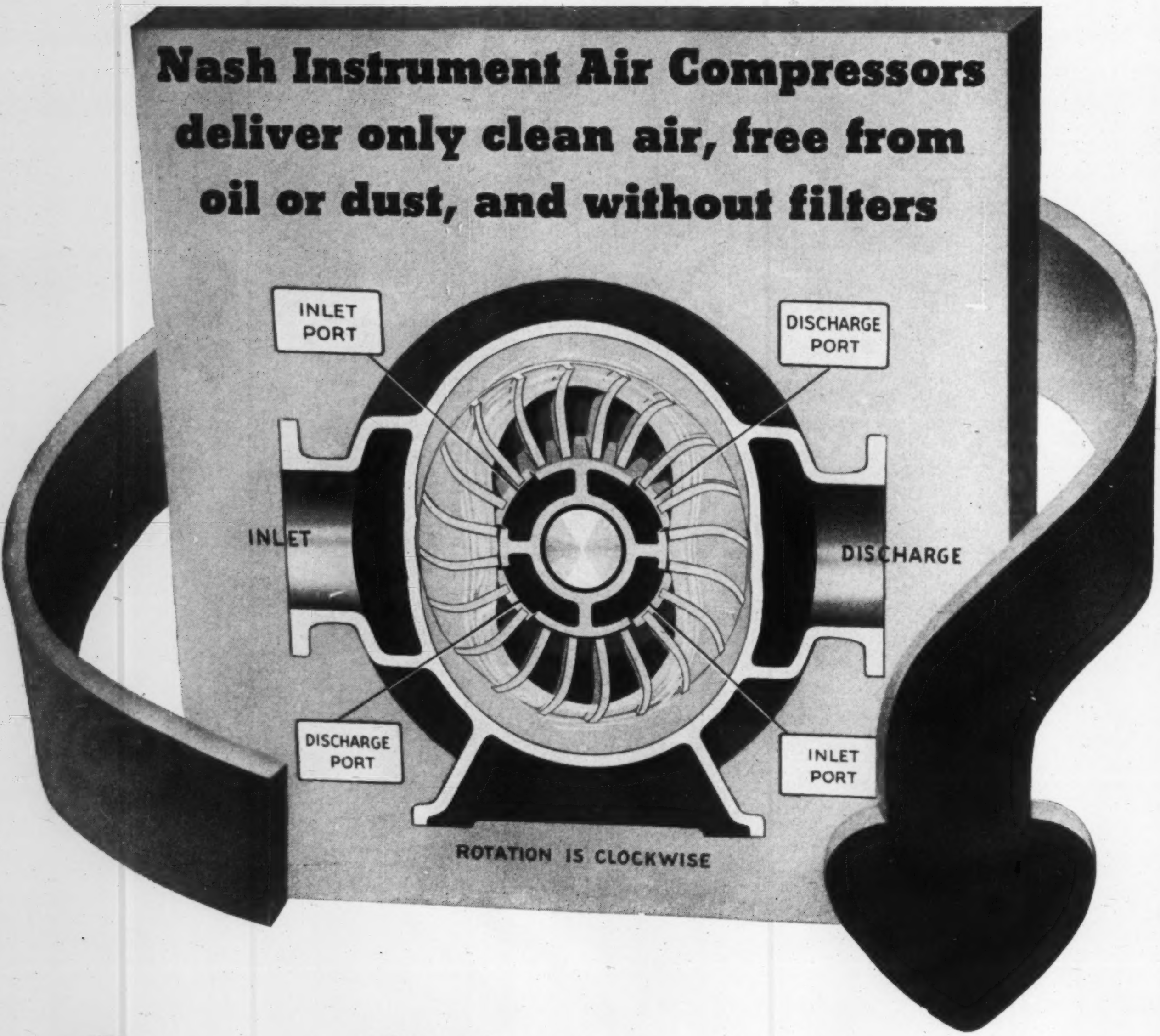
. . . phone or write

for complete information regarding component type **Tuning Fork Resonators,** or variously packaged **Tuning Fork Frequency Standards.**

Philamon Laboratories Inc.

90 HOPPER STREET, WESTBURY, LONG ISLAND, N. Y. EDgewood 3-1700

Nash Instrument Air Compressors deliver only clean air, free from oil or dust, and without filters



Here is Why!

You can dispense with oil filters and dust filters when you install ®Nash® Clean Air Compressors. You can save the cost of maintaining these devices. You can greatly reduce instrument maintenance costs. For the Nash employs no internal lubrication, therefore no troublesome oil is in the delivered air. Moreover, air from a Nash is thoroughly washed and cooled as it passes thru the pump. Dust in the plant atmosphere, even fly ash, is immediately removed.

®Nash® Clean Air Compressors are simple, with only one moving element. No valves, gears, pistons, sliding vanes, or other enemies of long life and constant performance complicate a Nash. No aftercoolers are needed. You will find it profitable to investigate these pumps, now.

No oil filters.
No dust filters.
No internal lubrication to contaminate air handled.
No internal wearing parts.
No valves, pistons, or vanes.
Non-pulsating pressure.
Original performance constant over a long pump life.
Low maintenance cost.

NASH ENGINEERING COMPANY
370 WILSON, SO. NORWALK, CONN.

Circle **48** on inquiry card. →

RADIO INTERFERENCE and FIELD INTENSITY *Measuring Equipment*

COMPLETE FREQUENCY COVERAGE—
14 kc to 1000 mc!

UHF

NM-50A . . . 375 mc to 1000 mc
Commercial Equivalent of AN/URM-17. Frequency range includes Citizens Band and UHF TV Band.

VLF

NM-10A . . . 14 kc to 250 kc
Commercial Equivalent of AN/URM-6B. Very low frequencies.

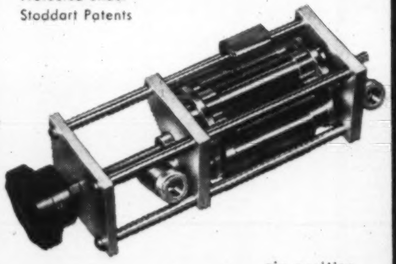
HF

NM-20B . . . 150 kc to 25 mc
Commercial Equivalent of AN/PRM-1A. Self contained batteries. A. C. supply optional. Includes standard broadcast band, radio range, WWV, and communications frequencies. Has BFO.

VHF

NM-30A . . . 20 mc to 400 mc
Commercial Equivalent of AN/URM-47. Frequency range includes FM and TV bands.

Protected under
Stoddart Patents



six-position

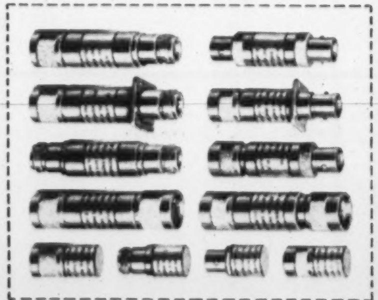
TURRET ATTENUATOR

featuring **PULL-TURN-PUSH** *action*

FREQUENCY RANGE: dc to 3000 mc.
CHARACTERISTIC IMPEDANCE: 50 ohms.
CONNECTORS: Type "N" Coaxial female fittings each end.
AVAILABLE ATTENUATION: Any value from 1 db to 60 db.
VSWR: 1.2 max., dc to 3000 mc/s, values from 10 to 60 db. As value decreases below 10 db, VSWR increases to not over 1.5.
ACCURACY: ±0.5 db.
POWER RATING: One watt sine wave power dissipation.

SINGLE "IN-THE-LINE" ATTENUATOR PADS and 50 ohm COAXIAL TERMINATIONS

This new group of pads and terminations features the popular Type C and Type N connectors, and permits any conceivable combination of the two styles. For example, the two connector types, either male or female, can be mounted on the same attenuator pad, with or without flanges, so that it may serve as an adapter as well as an attenuator. Frequency range, impedance, attenuation, VSWR, accuracy and power rating are as designated above. Send for free bulletin entitled "Measurement of RF Attenuation."



STODDART *Aircraft Radio Co., Inc.*

6644-D SANTA MONICA BOULEVARD, HOLLYWOOD 38, CALIFORNIA • HOLLYWOOD 4-9294

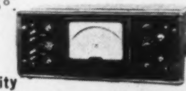
THE SYMBOL OF DEPENDABLE QUALITY IN INSTRUMENTATION

PHASE MEASUREMENT

TYPE 320-AB PHASE METER

• Proven Performance • Ease of Reading • Simplicity of Operation

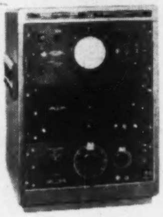
Measures phase angle 0° to 360° directly, from 20 cps. to 100 KC., sine or complex wave with single positive going axis crossing, meter scales 0° to 36°, 0° to 90° (any quadrant), 0° to 180°, 0° to 360°, absolute accuracy 1% of full scale +3°, incremental accuracy ±0.25°. High input impedance, input range 1 volt to 170 volts peak.



TYPE 322-A PRECISION PHASE METER

• High Precision • Extreme Accuracy • Versatility

Measures phase angle 0° to 360° directly from 20 cps. to 500 kc., sine or complex waves with single positive going axis crossing, meter scales 0° to 30° (in any 30° segment), 0° to 360°, absolute accuracy ±1° 20 cps. to 20 kc., ±5° 20 kc. to 100 kc., incremental accuracy 0.1°, high input impedance, input range 2 to 30 volts peak.



TYPE 704-A SECONDARY PHASE STANDARD

• Excellent Stability • High Input Impedance • Negligible Distortion

Precision variable phase shifter. Shifts given sine wave by any angle 0°-360° in four 90° ranges. Supplied for any specified single frequency between 60 cps. and 20 kc. Accuracy ±2°, incremental accuracy ±0.1°. Input impedance .47 meg. 13 mmf., output impedance 100 ohms, input signal 0.01 to 10 volts rms, gain unity ±10%.

TYPE 706-A ULTRA-SONIC PHASE STANDARD

High Precision • Excellent Stability • Simplicity of Operation

Generates two sine wave signals having variable phase difference 0°-360° at any specified single frequency 20 kc. to 200 kc., phase angle accuracy ±0.1° set by observation of multiple frequency Lissajous pattern on built-in scope, standard frequency supplied in 82 kc. (2000 yds. radar range), other frequencies special, 200 ohm output, 10 volts into 5 k.

TYPE 709-A BROADBAND SECONDARY PHASE STANDARD

• Minimum Number of Controls • Low Distortion • Good Stability

Develops two sine waves having 0-360° variable phase relation, input from external source 20 cps. to 20 kc. Phase read from dial calibrated from 0° to 90° in 1° division, four revolutions cover 360°. Accuracy ±1° from 20 cps to 10 kc, ±3° 10 kc to 20 kc. High input impedance, low output impedance.

TYPE 7000-B PRIMARY PHASE STANDARD

• Lissajous Presentation • Extreme Accuracy • Calibrates Precisely

Generates two sine waves having variable phase relation 0° to 360° which can be set to within ±0.05°, at any specified single frequency 60 cps. to 20 kc ±0.05%. Angles which are multiples of 1° can be set to ±0.01°. Lissajous pattern check on built-in scope. 200 ohm output, 1 to 10 volts range.

COMPUTER

TYPE 250-A
COMPLEX PLANE ANALYZER

- **Versatile**
- **Easily Operated**
- **Eliminates Computation**

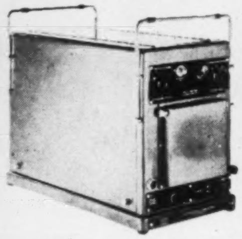
Multiplies and divides up to 10 complex vectors with magnitude inputs from 7 to 200 (or 1/7 to 1/200) for measurement, and from 1 to 10^{10} (or 1 to 10^{-10}) for storage and summation. Angle inputs 0° to 357° for measurement and 0° to 3600° for storage and summation. Overall computational accuracy within 1% for angle and log-magnitude. Output read on meter.

OSCILLOGRAPHIC RECORDING

TYPE 550-A OSCILLOGRAPHIC RECORDER

- **Direct Writing**
- **High Frequency Response**
- **Eight Channels**

For permanent, direct recording from zero to 900 cycles on blackened 35 mm acetate tape. High definition traces. Eight separate simultaneous traces and one timing reference trace. Variable tape speed gives 5 minutes total to 40 minutes total times. Galvanometer impedances available from 0.75 ohm to 7500 ohms. Built-in optical magnification and projection on screen.



VOLTMETER

TYPE 800-A
VACUUM TUBE VOLTMETER

- **Rugged and Compact**
- **Extended Ranges**
- **Stable and Accurate**

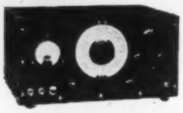
Highly accurate measurements of A.C. and D.C. volts, resistance and direct current. A.C. voltage range from 0.1 to 300 volts in eight steps, D.C. voltage range 0.1 to 1000 volts in nine steps, resistance range 0.02 ohm. to 5000 megohms in nine steps, direct current from 1 millimicroampere to 100 milliamperes. Special circuit eliminates effects of tube aging.

OSCILLATOR

TYPE 410-A
RF OSCILLATOR

- **Excellent Stability**
- **High Output Level**
- **Low Output Impedance**

Laboratory oscillator, 100 kc. to 10 mc., in six bands, output level up to 30 volts, or 12 volts for minimum distortion. Frequency calibration within ±0.5% 100 kc. to 4.65 mc., ±1.0% 4.65 mc. to 10 mc. Output voltmeter across 50 ohm output. Internal 1000 cps. modulation.

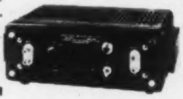


AMPLIFIERS

TYPE 500-A WIDE BAND DECADE AMPLIFIER

• Wide Band Response • High Stabilized Gain • Zero Phase Shift

Stabilized general purpose laboratory amplifier having flat response 5 cps. to 2 mc. on gain 10, 5 cps. to 1.5 mc. on gain 100, 5 cps. to 1 mc. on gain 1000. Zero phase shift, hum and noise 60 db below max. output. Input impedance 160 meg., and 7 mmf. 200 ohm output, 20 volts max. into 20k.



TYPE 501-A COMPRESSOR AMPLIFIER

• Wide Input Range • Uniform Output • Negligible Distortion

Negligible distortion, substantially constant output with 40 to 1 variations in input. Compression ratio 32 db 500 cps. to 1 mc., slightly less below 500 cps., harmonic distortion less than 0.5% up to 40 volts input, phase shift 0° ±2° 100 cps. to 20 kc., noise 45 db below constant 0.25 volt output. Input impedance 10 meg. 10 mmf. Output impedance 1k.

TYPE 502-A OSCILLOGRAPH AMPLIFIER

• Excellent Transient Response • Negative Feedback • Highly Stable

Designed especially to work with the Type 550-A Oscillographic Recorder, also for general purpose. Frequency range dc to 30 kc. Maximum gain 75 times, load impedance 7500 ohms, high input impedance. Internal calibrating signal source, provision for balancing out dc component of signal.

TYPE 511-A POWER AMPLIFIER

• Negligible Distortion • High Voltage Output Level • Phase Shift Compensation

Low distortion (1% max.) low noise and phase shift compensated amplifier for 50 cps. — 50 kc range. Output load characteristics: 5 ohms 12.8w, 25 ohms 13w, 200 ohms 15w, 1200 ohms 12w, down 1 db at 50 kc. Phase compensation permits holding phase shift constant with varying gain, or set at zero for a single gain setting at a single frequency.

IMPEDANCE MEASUREMENT

TYPE 310-A
Z-ANGLE® METER

- **Ease of Operation**
- **High Accuracy**
- **Versatility**

Measures directly: impedance (in ohms), phase angle (in degrees), dissipation factor (D), storage coefficient (Q). For frequencies 30 cps. to 2 kc. impedance range 0.5 ohm to 100 k, up to 20 kc. 0.5 ohm to 10 k, up to 40 kc., 0.5 ohm to 5 k. Magnitude accuracy ±1% above 10 ohms, phase angle accuracy ±2°. Internal test sources of 60 and 400 cps.

TYPE 311-A RF
Z-ANGLE® METER

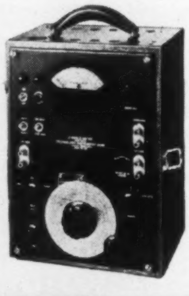
- **Ease of Operation**
- **Freedom from Computations**
- **Rapidity**

Companion instrument to Type 310-A Z-Angle Meter For frequencies 100 kc. to 200 kc., 10 ohms to 5 k., up to 1 mc., 10 ohms to 1 k., up to 2 mc., 10 ohms to 500 ohms. Magnitude accuracy ±3%, phase angle accuracy ±4°. Can be used with Type 410-A RF Oscillator as source.

TYPE 313-A
WIDE RANGE Z-ANGLE® METER

- **Direct Reading**
- **Wide Frequency Range**
- **High Accuracy**

For quick, easy, direct reading of impedance, phase angle, reactance, dissipation and storage factors. No calibrations or zero settings required. Covers frequency range 20 cps. to 1 mc., resistance values .9 ohms to 1.1 meg, inductance 0.15μh to 1600h, capacitance 2mmf. to 1600 mf. Used with external oscillator or internal 1000 cps. source.



Write for FREE CATALOG of TIC INSTRUMENTATION

TECHNOLOGY INSTRUMENT CORP.

549A MAIN STREET, ACTON, MASS.
P.O. BOX 3941,
NORTH HOLLYWOOD, CALIF.

For more information circle **49** on inquiry card.

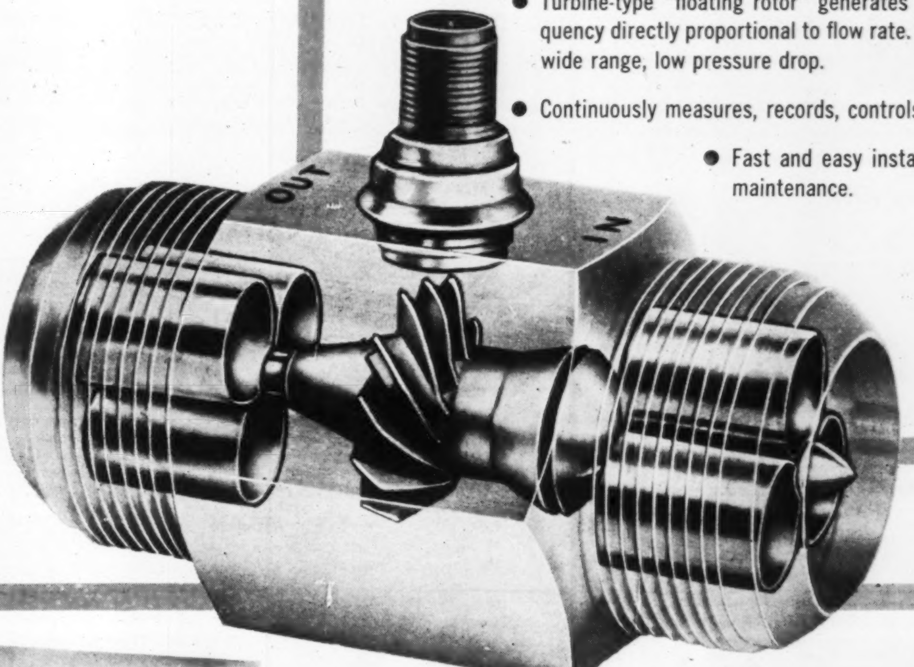
POTTER
FLOW CONTROL SYSTEMS

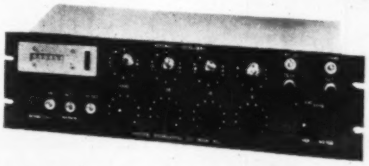
for highest accuracy . . . trouble-free operation even under most difficult conditions

For all liquids, caustics, acids including HC1. Accurate within ½% at temperatures up to 1200°F., and at pressures to 35,000 psi.

POTTER FLOW SENSING ELEMENT

- Turbine-type "floating rotor" generates current with frequency directly proportional to flow rate. Inherently linear, wide range, low pressure drop.
- Continuously measures, records, controls liquid flow.
- Fast and easy installation, low maintenance.





Model 24 POTTER PRESET FLOW TOTALIZER

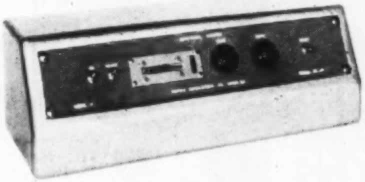
- For batch mixing and controlling preset quantities of liquids.
- Produces control action when preset count is received from any Potter Flow Sensing Element.
- Presetable to four significant digits. Optional X10 and X100 factors.
- Indicates total number of completed cycles.
- Can be used for direct reading of flow total or as ten-digit counter.

(Spec. Sheet L-4)

Model 21 POTTER TOTALIZER

- System accuracies as high as 1/10%.
- Low cost, compact industrial counter.
- Ten millivolt sensitivity to 1 KC.
- Simplified circuitry for low maintenance.

(Spec. Sheet L-2)



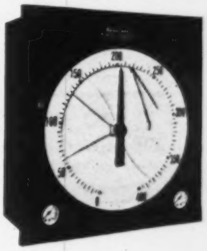
Model 3C POTTER FREQUENCY CONVERTER

- Versatile, portable, flowmeter or tachometer.
- Measures flow through any Potter Flow Sensing Unit.
- Measures speeds to 190,000 RPM.

(Spec. Sheet L-1)

INDUSTRIAL RECORDERS AND CONTROLLERS

- Indicate, Record, Control Flow Rates or Ratios.
- Use any standard type of industrial potentiometer.
- Available with any standard control form.



For copies of the bulletins listed above, please contact us. In receipt of details, we will be glad to cooperate in the selection of a flow metering system to meet your requirements.

Potter

POTTER AERONAUTICAL COMPANY
Route 22 • Union, N. J. • Phone MUrdock 6-3010
MAKERS OF "POTTER ENGINEERED" PRODUCTS

For more information circle **50** on inquiry card.

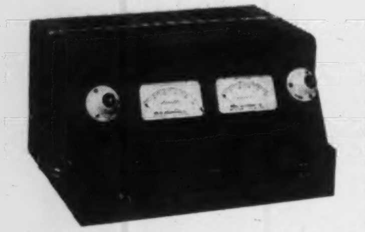
FROM MILLIWATTS TO KILOWATTS

HIGH VOLTAGE POWER SUPPLIES AND EQUIPMENT

We have sold quantities of these power supplies to laboratories, industrial concerns, the government and universities. Only the best available selected material goes into these units, so that you will have many years of dependable service. Only a few of our standard models are shown below. Quotations on special supplies cheerfully given.

PRECISE MEASUREMENTS COMPANY

HIGH VOLTAGE POWER SUPPLIES



A precision, well constructed high voltage supply for meter testing and calibration, electrostatic painting, breakdown tests, nuclear physics and wherever high potentials at low currents are needed. Output is well filtered direct current. Adjustable by means of a control on the front panel. Available with or without meter. Input voltage is 115 v., 60 cycles. Regulated models feature even easier adjustment of output voltage. Once you turn the knob to desired value, voltage then remains constant regardless of power line changes or load variations. Regulation is ±1% or better over most of the control range. Closer regulation on special order.

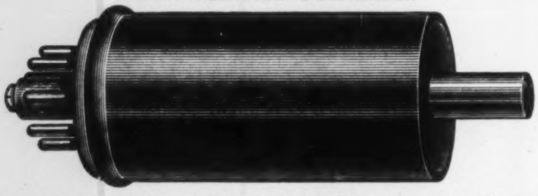
Model		Maximum Voltage	Price	Price Regulated Model
6000		2,500	**$60.00**	
6000-A	With Kilovolt Meter	2,500	**80.00**	**120.00**
6005		5,000	**75.00**	
6005-A	With Kilovolt Meter	5,000	**95.00**	**135.00**
6010		10,000	**85.00**	
6010-A	With Kilovolt Meter	10,000	**105.00**	**145.00**
6015		15,000	**95.00**	
6015-A	With Kilovolt Meter	15,000	**115.00**	**155.00**
6025		25,000	**115.00**	
6025-A	With Kilovolt Meter	25,000	**155.00**	**205.00**

Available with two meters (as illustrated) thus current and voltage can be read simultaneously. Perfect for breakdown and leakage measurements. Automatic circuits protect meter on shorts. Price $35 additional. Specify 50 uamps, 100 uamps or 1 mill meter. Same delivery time.

INSULATION MEGOHM METER

Reads directly in megohms any resistance value up to 40,000 Megohms. Excellent for measurements of high ohmic resistors, insulators and electrical components. In addition to the megohmeter, a second meter (Kilovoltmeter) accurately shows the exact applied test voltage. Test voltage is adjustable to 25,000 volts. D.C. **Price $250.00**

HIGH VOLTAGE CONVERTER



Changes battery voltage directly to high voltage. Complete with built in chopper and miniature transformer. Output adjustable from zero to 7,000 volts AC (or D.C. when rectified). Perfect for megohmmeters, infra red devices, ignition purposes, geiger counters, scintillators.

MODEL	PRIMARY	SECONDARY	PRICE
7 MVT	1 to 4 volts	0 to 7,000 V AC Max.	$12.50

100 KV. KILOVOLTMETER

- Read High Voltages Directly with Extra-High Input Impedance.
- Single Instrument Reads Both A.C. and D.C. Voltages!
- Superb Craftsmanship—Portable Secasian Walnut Cases.

Model	Range Kilovolts	Price D.C. Model	Price A.C/D.C. Model
4000	0-25/50	$67.50	**$100.00**
4000-A	0-100	80.00	**125.00**
4000-B	0-50/100	85.00	**130.00**
4000-C	0-10/50/100	95.00	**160.00**

Other Ranges to Order ....

INDUSTRIAL POWER SUPPLIES

Regulated Types Available

These industrial type power supplies are built for service and efficiency. All employ husky components that have been selected for their power handling capacity. Controls are arranged so that operation is greatly simplified and a number of safety features are built in for maximum protection of personnel and equipment. Polarity reversing models (as illustrated) can be had at additional cost.

Model	Voltage	Current	Price
F-6005-A1-H	0-5000	100 MA	**$550.00**
F-6005-A1-5H	0-5000	500 MA	**650.00**
F-6005.A1-5H	0-5000	1 Amp	**800.00**
F-6010-A1	0-10,000	100 MA	**800.00**
F-6020-A05	0-20,000	50 MA	**975.00**

HIGHER VOLTAGE SUPPLIES

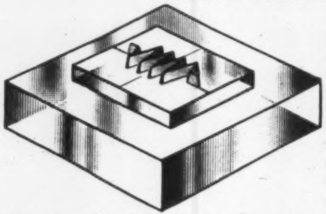
Model	Maximum Voltage	Price Unregulated	Price Regulated
6030-AIR	30,000	**$200.00**	**$300.00**
6040-AIR	40,000	**400.00**	**450.00**
6050-AIR	50,000	**500.00**	**600.00**
6100-AIR	100,000	Other ranges available	Price on request

ULTRA-SENSITIVE RELAYS

These compact units are very rugged. Sensitivity to 5 uamps at 100 millivolts. Unit consists of powerful relay controlled by reliable transistors. Requires only a small battery to operate. Battery life is almost equal to shelf life as current drain is negligible. Contacts rated at 2 amps.

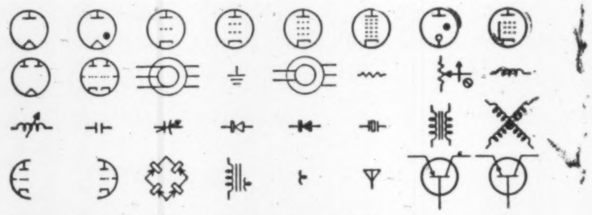
Model	Sensitivity	Price
5 UA	5 Microamps	**$50.00**
10 UA	10 Microamps	**40.00**
100 UA	100 Microamps	**25.00**

TRANSPARENT SYMBOL STAMPS



Each stamp is made like a fine gem. Edges are polished—Unit is crystal clear.

YOU CAN STAMP SYMBOLS IN TWO SECONDS . . . Simply ink and make your impression. Stamps are crystal clear and easily lined-up by looking right throught them. Built-in "CROSS HAIRS" allow pin point positioning. Stamps have razor-sharp impressions and anti-clogging qualities. Made of vinylite plastic which resists abrasion and is more resilient. Unaffected by gasoline, benzine, and many acids and alkalies. Stamps may be purchased separately at one dollar each or in complete sets.



GOVERNMENT SERIES SET. Widely used by both government and Industry. Consists of 32 selected symbols as shown. All are strictly in accordance with standard specifications. **Price $25.00** .... Set of 32 Symbols

ALSO AVAILABLE:
- **Industrial Series (38 stamps) @ $25.00 per set**
- **Handy Stamp (12 stamps) @ $8.50 per set (small size). Larger size $10.00 per set**

AUTHORIZED FACTORY DISTRIBUTOR

Industrial Directron Selenium Rectifiers and Special Purpose Electronic Tubes . . . Write for literature on your letterhead.

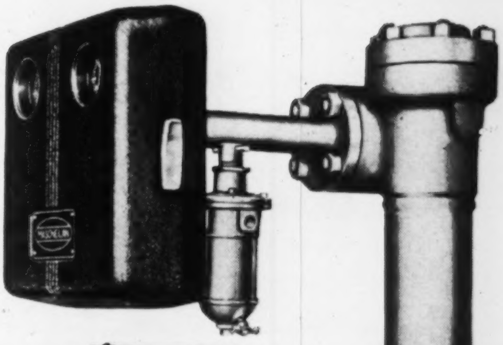
BARRY ELECTRONICS CORP.

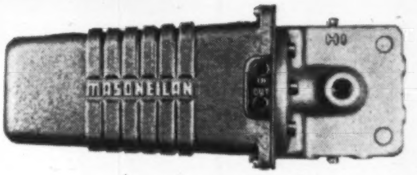
512 Broadway
New York 12, N. Y.

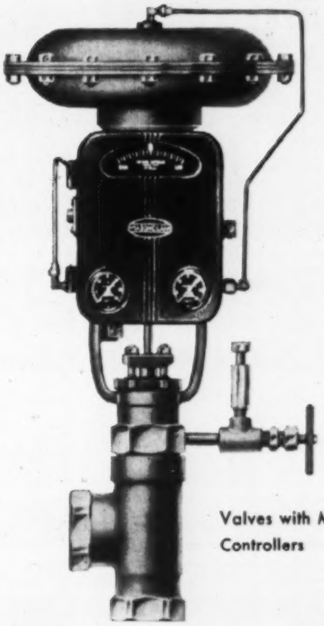
WAlker 5-7000
Cable: BARRYLECT, N. Y.

For more information circle **51** on inquiry card.

Indicating, Recording and Non-indicating Controllers


Liquid Level Controllers


Differential Pressure Transmitters

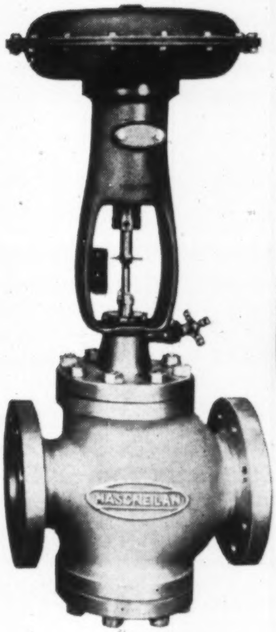

Valves with Mounted Pressure Controllers

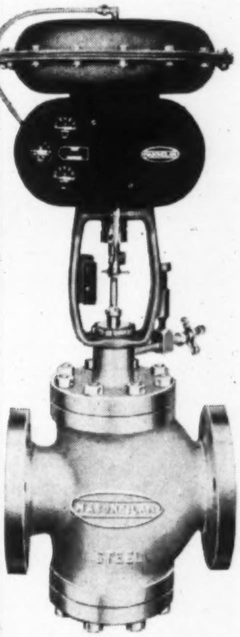
Mason-Neilan

Serves the Process Industries with Accurate and Reliable Control Equipment

Since 1882 Mason-Neilan has supplied industry with a wide variety of standard and specialized automatic control equipment for process and associated services. Each is a development of practical engineering based on experience gained in close contact with industrial control problems. Each is specifically designed to do an exceptional job. With Masoneilan products you get engineered equipment that assures superior performance, long life with minimum maintenance.

When writing for information please specify item or items which interest you.


Wide Variety of Control Valves


Valve Positioners

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MASON-NEILAN REGULATOR COMPANY

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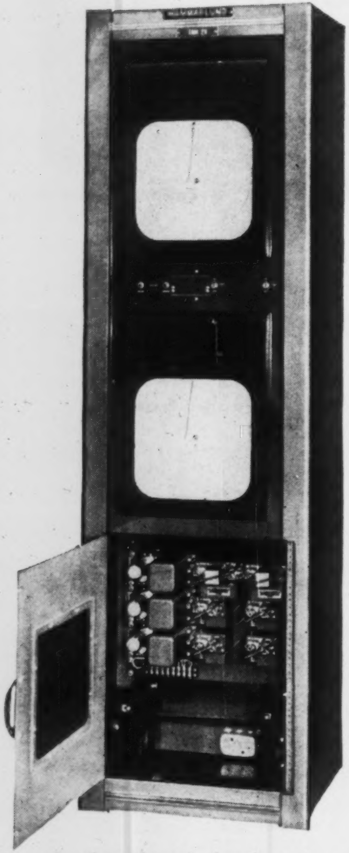
Corpus Christi • Denver • Appleton • Birmingham • New Orleans • Dallas • Seattle • Mason-Neilan Regulator Co., Ltd., Montreal, Toronto and Vancouver

For more information circle **52** on inquiry card.

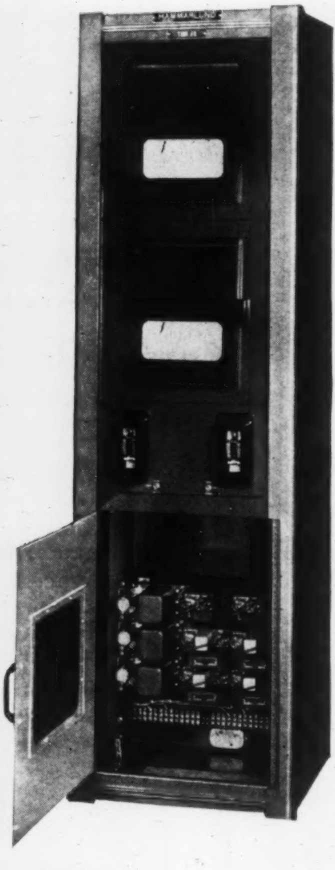
Centralized Operations Control...

Remote Supervisory Controls For Industrial & Governmental Use

- *Puts all controls and metering in your central office.*
- *Provides simultaneous and continuous operations.*
- *Uses your present instruments if desired.*
- *Uses just one telephone circuit or radio channel.*
- *Is tested, proven, and safe.*



Central terminal equipment for control of remote operations and display of telemetered information.



Remote terminal equipment. Operates in response to signals received from the central control point to perform ON-OFF and OPEN-CLOSE operations and returns metered data. Local control and indicating meters are also included.

Your present equipment can be integrated into a Centralized Operation Control system. What COC does is modernize it to the extent that all your normal control and telemetering operations can be handled from a single central point over a single telephone circuit. Or, radio or microwave may be used.

Now, valves and switches can be opened and shut, pumps and other machinery can be started and stopped, flow, levels, voltages and most all other quantities can be metered, all from your central control point. And all these functions can be operated continuously and/or simultaneously as desired.

And, you don't have to have an electronics specialist on the job to operate your COC system. Once installed, any capable communications service man, electrician or instruments man can service it.

COC systems are flexible. All units are open-ended for future expansion. An almost unlimited number of functions are possible, but you buy only what you need at the start.

Perhaps the most attractive feature to those who are responsible for controls and remote instrumentation is dependability and safety. COC units loaf most of the time—they are designed with an 8 to 1 safety factor. And there are all the extensive fail-safe and alarm features built in that you will want.

For full information, write to The Hammarlund Manufacturing Company, 460 West 34th Street, New York 1, New York.

Ask for Bulletin I-5.

HAMMARLUND

Since 1910

For more information circle **53** on inquiry card.

THE 1956

INSTRUMENTS and AUTOMATION CATALOG & INDEX

THIS is the most complete directory of instrumentation products ever published.

It has been compiled as a purchasing directory for the users of instruments and devices for

measurement,
analysis,
counting and computing,
metering and weighing
inspection and testing,
automatic control,

and manual control (both local and remote), and microscopy, and spectroscopy, and medicine, and photography, and navigation, and surveying, and other fields or occupations too numerous to list here.

Since the appearance of THE 1954 INDEX two years ago, the names of 652 companies which had not appeared in previous editions have been added; the names of 72 companies appearing in previous editions have been removed; and hundreds of name-and-address changes have been made. The number of companies listed in the Directory Section at the back (page 243-275) has increased from 1889 in the preceding edition to 2569 in this one.

This directory is arranged, indexed and cross-indexed to make its contents easily available.

The Index Section—"Who makes what"—is the most important. Anyone who wants to know where he can buy or secure information on a certain product will find the product properly indexed and cross-indexed, and under it the names of the manufacturers of this product; and also the names of the sole representatives.

Indexing System. Products are indexed under the main word. In cases where a name is ambiguous, or where the item is known under two or more names, companies making the device are listed under one heading and cross-references are inserted under the other headings.

Specific Terms. You never are in need of "a gage," but of some particular kind of gage. Therefore we do not list manufacturers under broad general designations. For example, we do not list any names under the main heading "Meters" but we give the sources of supply for numerous classes and types of meters. Moreover, we do not list any names under "Meters, Liquid" alone, but we give under proper subheads the sources of supply for the *class* and *type* of liquid meter you may need.

Correctness of Listings. Every company name listed under a specific heading has been placed there because the company declared, in a signed statement, that it (1) manufactures the product or (2) is the sole representative of the manufacturer. When you need a device made by a number of companies, look under the name of that device. On the other hand, whenever you desire to order at one time a variety of equipment made by different firms, you may find it most convenient to get in touch with a recognized, competent, "laboratory or electronic supply house." These houses are listed under "*Apparatus, Laboratory,*" and "*Electronic Parts & Equipment Distributors.*"

Instruments' Further Service. This Index contains the answers to only 99% of your inquiries. If you cannot find the product or the name you want, communicate with the Information Section, Instruments Publishing Co., 845 Ridge Ave., Pittsburgh 12, and every effort will be made to furnish the information promptly.

Suggestions. We shall appreciate suggestions regarding:

1. Headings not at present found in this Index which should be there,
2. Firms listed erroneously, and
3. Other inaccuracies which may have crept in despite all precautions.

Use this INDEX consistently. You will find the companies listed herein equipped to render the kind of service which saves time and helps make satisfied customers.

Where companies in whose products you are interested have omitted descriptions, your cooperation is invited in bringing this to the attention of the supplier or the publisher. Also, whenever the INDEX has aided you, please inform the manufacturer that his data in THE INSTRUMENTS and AUTOMATION CATALOG & INDEX were of help to you.

You're covered across the board

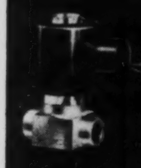
when you use
General Controls' line of quality automatic controls

More and more designers find one simple rule short-cuts their control problems with a quick solution: "Check General Controls first!" For the chances are the complete GC line has the perfect answer to your problems whether it's a time switch or thermostat, a midget solenoid or mighty hydramotor. Get acquainted with the branch office (one of 40) nearest you . . . one source—one responsibility—near at hand—at your service.

K-21 MAGNETIC STOP VALVE

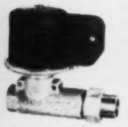
Packless 2 way normally closed. For air, gas, steam, water, oil, corrosive fluids. Pressures to 300 psi. Forged brass body. Stainless steel or soft seat.

K-27 MAGNETIC VALVE



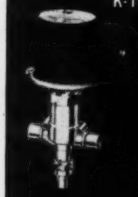
Stainless steel for high sulphur fuels, syrups, juices, acids, alkalis, etc. Pressures to 300 psi. Midget size. Multi-poised—operates in any position.

K-10 MAGNETIC VALVE



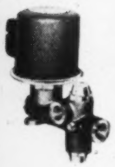
Lever action for higher seating pressure. Excellent general purpose valve for primary fuel, feed water, steam, air. (300 psi maximum operating pressure differential.)

K-15 MAGNETIC VALVE



Piloted piston design. Large flow capacity with low pressure drop. For air, gas, steam, oil derivatives. Versatile—with 3 coil classes, 5 seat variations.

K-123 MAGNETIC VALVE

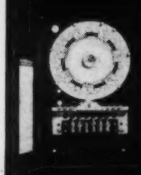


3 way—for normally open or normally closed directional control and mixer applications—on pneumatic or hydraulic operated devices, machine tools, etc.

RECORDING CONTROLLER

Pneumatic Recording Controller in cast aluminum case. Assemblies interchangeable. One of General Controls' wide line of pneumatic indicators, recorders and controllers.

PROGRAM TIMER

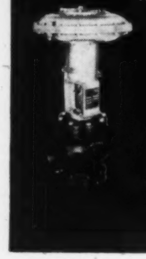


Program Timer, powered by electric or spring-wound clock. Controls daily or weekly operations. Maximum 12 operations a day; 18 minute "off" period.

HYDRAMOTORS

Wide range of types in complete range of pipe sizes and body styles to provide safe, dependable, durable answer to all liquid transfer problems.

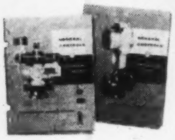
AIR MOTOR VALVES



Air-operated diaphragm valve for modulating control. Normally open or closed. 3 way or slide gates. Selection of various inner valves, body sizes and connections.

General Controls
Automatic
Control Line

WRITE for Industrial and Hydramotor catalogs on company letterhead. Address requests to:



GENERAL CONTROLS CO.
801 Allen Ave., Glendale 1, Calif.

1930 25 YEARS 1955

1955 SILVER JUBILEE YEAR

GENERAL CONTROLS

MANUFACTURERS OF AUTOMATIC CONTROLS FOR HOME, INDUSTRY AND THE MILITARY

GENERAL CONTROLS • PERFEX CONTROLS
40 FACTORY BRANCH OFFICES SERVING THE UNITED STATES AND CANADA

FIVE PLANTS: IRON MOUNTAIN, MICHIGAN •
GLENDALE, CALIFORNIA • BURBANK, CALIFORNIA
SKOKIE, ILLINOIS • GUELPH, CANADA

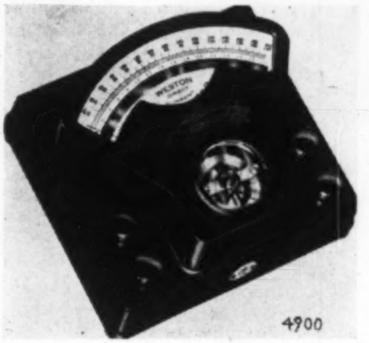
For more information circle **54** on inquiry card.

NEW INSTRUMENTS DEPARTMENT, CONCLUDED FROM PART ONE OF THIS ISSUE

ELECTRICAL and ELECTRONIC INSTRUMENTS

Electrical Indicating Instruments

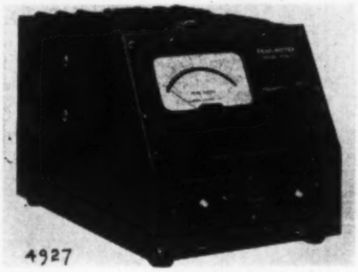
New models of "Model 1" embody first basic change since its original development in 1888: use of a core-magnet mechanism containing an Alnico V core inside moving coil. New mechanism is said to provide "inherent shielding, plus greater stability, rapid response, excellent damping and long continued accuracy." Instrument can be left in circuit continuously or subjected to a wide range in temperature without serious effect on accuracy, which is 0.25% of full-scale.—*Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.*



For more information circle **501** on inquiry card.

Ballistic Voltmeter

New "Model PTM-7 Peak-Meter," with improved performance characteristics over earlier models, responds to peaks regardless of input wave-form, and holds reading until reset button is depressed. Range 0.1 to 300 volts. Response 2 usec (speed has been more than doubled) and accuracy improved to 2% of full scale. Primarily intended for single pulses but more usable on repetitive signals than its precursors.—*Control Devices, Inc., 8299 E. 9 Mile Road, Van Dyke, Mich.*



For more information circle **502** on inquiry card.

"S"-band Wavemeter

New "C & D" Wavemeter," for frequency range from 1800 to 3800 Mc, features highly-sensitive indication of resonance; control for setting sensitivity micrometer extending outside instrument to provide easy reading; precision cavity assembly for accurate repeatable readings, with an anti-backlash device which further enhances accuracy.—*Amerac, Inc., 116 Topsfield Road, Wenham, Mass.*

For more information circle **503** on inquiry card.

Electrical Indicating Instruments

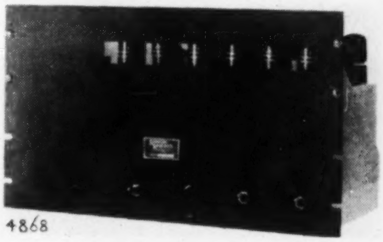
milliamperes
4845

New "Medalist Meters" feature design with 50% more scale length in same space as conventional round or square instruments; are available in 2½-in. and 3½-in. sizes and in various colors; meet standard ASA/JAN dimensional requirements.—*Marion Electrical Instruments Co., Manchester, N. H.*

For more information circle **504** on inquiry card.

Frequency Counter

New "Model 1005 Events-per-Unit-Time Meter" counts up to 100,000 per second with accuracy of ±1 count; is said to be "ideally suited to frequency measurement as required in telephone carrier maintenance"; can be provided wth an automatic reset circuit when required; operates at -20 dbm level from 60 cps. to 100 kc. Input impedance 100,000 ohms.—*Ransom Research, P. O. Box 382, San Pedro, Calif.*



For more information circle **505** on inquiry card.

Frequency Meter

New "Type 504 Heterodyne Frequency Meter," for precise measurement of frequencies from 100 Mc. to above 10,000 Mc., features direct-reading dial, visual and aural zero-beat check, crystal calibration, and sensisivity of better than -30 dbm at 500 Mc. and above. It comprises heterodyne oscillator, high-gain video amplifier, crystal calibrators, harmonic generators, and cathode-ray tube. Accuracy 0.004% at 5-Mc. check points; interpolation accuracy better than 0.02%; resetability of oscillator 0.02%. Provision for zero-beating with WWV.—*Polytechnic Research & Development Co., Inc., 202 Tillary St., Brooklyn 1, N. Y.*

For more information circle **506** on inquiry card.

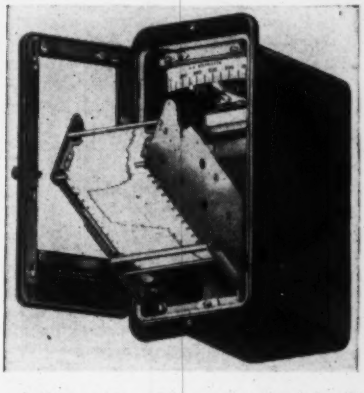
Frequency Calibrator

New "RH-10A Standard Frequency Calibrator" is designed to receive WWV transmissions at 5 and 10 Mc, and audio signals at 440 or 600 cps; has a sensitivity of better than 1 uv on all bands, image rejection of more than 50 db, front-panel provision for coupling secondary standard and other rf sources, and built-in panel speaker.—*Browning Laboratories, Inc., 750 Main Street, Winchester, Mass.*

For more information circle **507** on inquiry card.

Recording Instruments

New "Type 44" direct-writing recorders are available as ammeters, voltmeters, wattmeters, varmeters and frequency meters in models for portable use and for flush or projection switchboard mounting. Performance is well within ASA Standard C39.2 for instruments of 1% accuracy.—*Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.*



For more information circle **508** on inquiry card.

Rms. Noise Voltmeter

New "MV-19A" signal-to-noise ratio voltmeter covers frequency range of 20 cps. to 200 kc. with its internal rms. voltage detector (crystal diode) and up to 200 Mc. with its external probe. Said to be "the most versatile and most reliable noise voltmeter in the field today," it utilizes a noise-measuring method whose advantage is that measuring accuracy does not

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(Pages 1058 to 1099 are in Part One of this July 1955 issue) depend upon frequency response of attenuators, nor upon frequency spectrum of noise generators, nor upon frequency response of oscilloscopes. Instead, noise measurements are made by feeding into amplifier under test "reference signals" from a calibrated signal generator and measuring output of amplifier. An adjustable divider reduces amplified signals and amplified noise to low level at which rms. detectors of "MV-19A" operate strictly in their square-law region.—*Millivac Instrument Corp., P. O. Box 997, Schenectady 6, N. Y.*

For more information circle **509** on inquiry card.

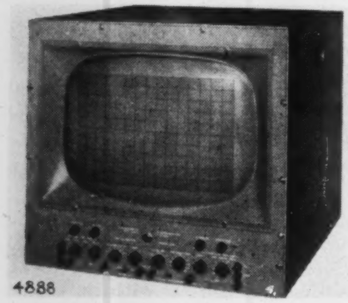
Clamp-on Volt-ammeter

New "Model 749" is a light-weight pocket-size clamp volt-ammeter, with a single easily-read multi-scale dial for six current ranges and three voltage ranges; employs a special shock-mounted self-shielded "Cormag" instrument movement.—*Weston Electrical Instrument Corp., 614 Frelinghuysen Avenue, Newark 5, N. J.*

For more information circle **510** on inquiry card.

Large-screen 'Scopes

New series of 12 models of large-screen (17-in. and 21-in.) oscilloscopes feature flat frequency response from dc. to 10,000 cps. (down 3 db at 100,000 cps.) with dc amplifiers and inverse feedback to assure stability; 1% trace linearity; 2% measuring accuracy.—*Technomatic Instrument Co., 11368 W. Olympic Blvd., W. Los Angeles 64, Calif.*



For more information circle **511** on inquiry card.

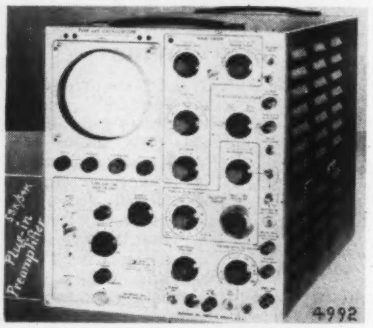
Cathode-ray Oscilloscope

New "Model 534 D.C. Midgetscope," said to be "designed for Circuits of the Future," combines linear sweep with d.c. amplifier for color TV television restorer circuits and for complex wave forms.—*Radio City Products Co., Inc., Easton, Penna.*

For more information circle **512** on inquiry card.

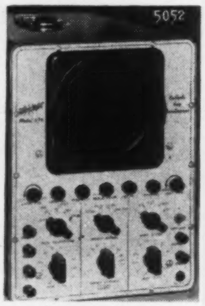
Dc-to-30-Mc 'Scope

New "Type 545," in combination with "Type 53K/54K" plug-in preamplifier, has vertical-amplifier rise-time of 12 millimicroseconds and pass-band of dc to 30 Mc at calibrated sensitivities from 0.05 v/cm to 20 v/cm, with 20 uuf input capacitance direct, 7.5 uuf with 10× probe.—*Tektronix, Inc., P. O. Box 831, Portland 7, Oregon.*



For more information circle **513** on inquiry card.

Five-inch TV 'Scope

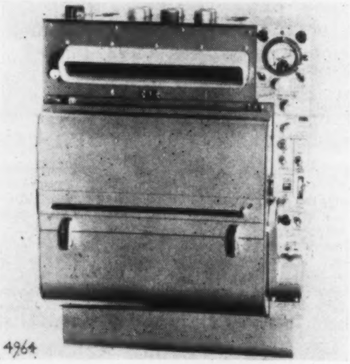


New "Model 675" is a high-sensitivity wide-band 'scope in medium-price range compatible for color or b&w TV servicing; features a calibrated and illuminated scale with a green filter to reduce reflections caused by incidental illumination. Astigmatic focus control provides a new standard in undistorted trace sharpness. Owing to a new circuit design, wide-band response is not achieved at expense of sensitivity; hence no further need of dual sensitivity or band-width switching. Sensitivity 20 mv rms per inch.—*Hickok Electrical Instrument Co., 10519 Dupont Ave., Cleveland 8, Ohio.*

For more information circle **514** on inquiry card.

Oscillographs

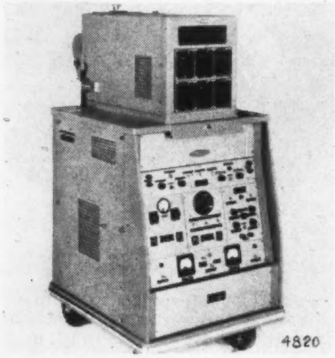
New "Series 700C" oscillographs have all automatic operating controls on front panel, are also designed to simplify internal adjustments. Record magazines can be loaded in daylight, are designed to handle a variety of recording film or paper up to 12-in. width. "Model 708C" has a maximum of 36 channels and handles record widths to 8 in; "Model 712C" 60 channels and 12-in. widths. Record speeds range from 1/32 to 144 ips.—*Heiland Div., Minneapolis-Honeywell, 130 E. 5th Ave., Denver 3, Colo.*



For more information circle **515** on inquiry card.

Cathode-ray Oscillograph

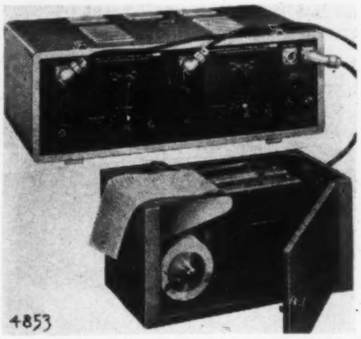
New "Type SC-16B" features writing rate of 5,000,000 ips. and chart speeds up to 6,000 ips.; frequency response 0 to 200 kc.; improved camera-type lenses to increase trace definition; several different methods of recording on continuously-driven 6-in. or 35-mm. film or paper or on drum-type charts.—*Hathaway Instrument Co., 1315 S. Clarkson St., Denver, Colo.*



For more information circle **516** on inquiry card.

Oscillograph System

New high-speed direct-writing "Type P Portable Dynograph" can be set up for use in seconds; can be used with reluctance type gages without auxiliary equipment. Maker's exclusive chopper amplifier yields sensitivity of 15 microvolts d.c. per millimeter of pen deflection; response time less than 1/120th second; absolute stability: no zero drift.—*Offner Electronics, 5320 N. Kedzie Ave., Chicago, Ill.*



For more information circle **517** on inquiry card.

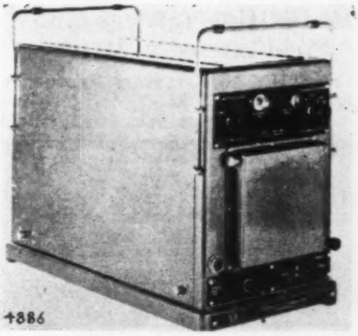
Chopper-stabilized D-c Oscilloscopes

New "VS-900B Series" sensitive dc 'scopes have exceptionally small dc drifts, owing to chopper-stabilization of their vertical amplifiers. Guaranteed drifts are less than 1 mv after 2-min. warm-up. Dc sensitivity is 700 uv/cm. Three models: "VS-930B" has symmetrical push-pull input on its most sensitive range (700 uv/cm) only; "VS-940B" has symmetrical push-pull input on all ranges to facilitate elimination of interference at high as well as low signal levels; "VS-960B" has a built-in "hushed transistor preamplifier" with less than 1 uv rms noise over a 60 kc pass-band.—*Volkers & Schaeffer Mfg. Corp., P. O. Box 996, Schenectady, N. Y.*

For more information circle **518** on inquiry card.

Eight-channel Oscillograph

New direct-writing eight-channel "Type 550A Oscillographic Recorder" has frequency response flat within 3% from zero to 900 cps. Each waveform is scribed as a transparent line on blackened 35-mm acetate film stock by a galvanometer-actuated stylus which produces a high-definition trace of constant width. Stylus excursion about 1 mm. Direct optical projection of film strip onto a hooded ground glass screen provides enlargement for study or for viewing recording in progress. Ninth channel is solenoid-actuated for timing or reference marking. All connections are independent. Film speeds 1, 2, 4, or 8 cm/sec.—*Technology Instrument Corp., Acton, Mass.*



For more information circle **519** on inquiry card.

A-c Magnetic Bridge

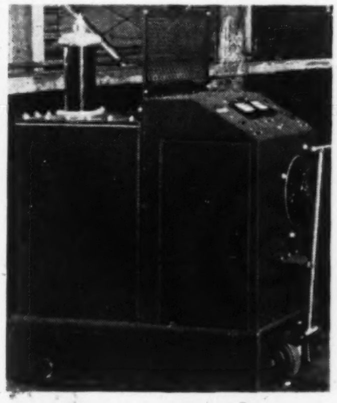
New "Model 6400A" is said to be "the first magnetic bridge to be commercially available for accurately measuring permeability and core losses at inductions up to 16 kilogausses." It is a modified Hay Bridge with extremely accurate resistor and capacitor decades, a complete switching network for ease of operations, and internal filters for 60, 400, and 1000 cps measurements. An extremely accurate Epstein Frame is furnished. Accuracy is equal to that of Epstein Methods and all tests meet ASTM 343-49.—*Shallcross Mfg. Co., Collingdale, Pa.*

For more information circle **524** on inquiry card.

ELECTRICAL TESTING and SERVICING

Mobile 50-kv Testers

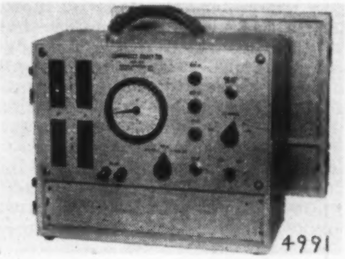
Newly-redesigned 50-kv general-purpose mobile a-c test sets provide smoothly-variable test voltages from 0 to 50,000 at 5 kva for high-potential testing of electrical apparatus and insulating materials. Extremely high accuracy is obtainable in the range of 15 to 100% of rated voltage.—*Power Transformer Dep't, General Electric Co., Pittsfield, Mass.*



For more information circle **520** on inquiry card.

Continuity Analyzer

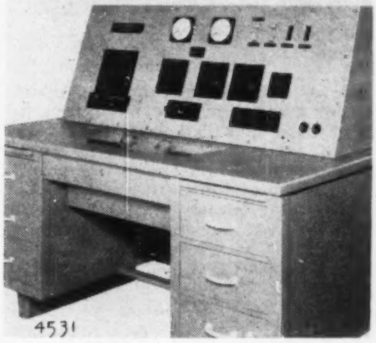
New "Model CA55" automatically tests multiple-resistive networks or multi-conductor cables: each circuit checked for continuity and circuit resistance and tested with every other circuit for shorts, leakage resistance and hi-pot. Fifty separate conductors or paths can be tested in less than one minute.—*Technical Development Corp., 4060 Ince Blvd., Culver City, Calif.*



For more information circle **521** on inquiry card.

Watthour-meter Test Console

New "Type RST-2 Knopp Uniload Rotating Standard Testing Equipment" utilizes "Knopp Uniload System" whereby (a) reference rotating standard receives exact known multiples or fractions of selected test currents and voltages; (b) reference standards need be used only on one current and voltage range and standards always operate at full load and full rated-voltage; (c) precision multirange transformers always work at full excitation.—*Electrical Facilities, Inc., 4250 Holden St., Oakland 8, Calif.*



For more information circle **522** on inquiry card.

Signal Generator

New "Model 3432-A" has complete frequency coverage from 160 kc to 110 Mc with no skips in frequency for AM-FM radio, monochrome or color TV servicing; features a large easily-read etched aluminum dial, smooth planetary drive dial for ease and accuracy in adjustment; seven directly-calibrated 160° scales.—*Triplett Electrical Instrument Co., Bluffton, Ohio.*

For more information circle **523** on inquiry card.

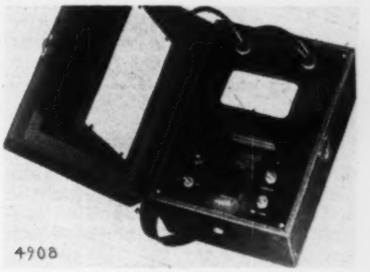
Dynamometer

New "Model DM-4 Dyna-Chek" determines hp, torque and rpm of electric motors in continuous duty 1 hp or less; up to 2 hp in intermittent service; can be supplied in individual units or as complete custom installations.—*Western Gear, Electro Products Div., P. O. Box 182, Lynwood, Calif.*

For more information circle **525** on inquiry card.

Dielectric Testers

New "430 Series Hypots" with output voltages up to 6000 vac combine visual indication of leakage, breakdown and short circuits with a loud buzzer signal. Audio alarm circuit is designed around a new type of microampere relay and uses no tubes. Fault detection is stable and has a repeat accuracy of better than 10%. Detector circuit has sufficient power to actuate relays.—*Associated Research, Inc., 3767 W. Belmont Ave., Chicago 18, Ill.*



For more information circle **526** on inquiry card.

WSWR Computer

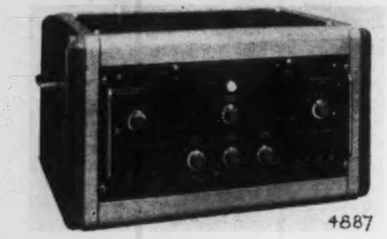
New "Model 621B" provides full operator convenience in automatic tests of microwave components and systems. Four linear scales, each covering a 10 to 1 range, are provided for voltage reflection coefficient percentages from 0.5 to 100. In addition, 6½-in.-wide indicating instrument on panel carries two VSWR ranges: from

1.01 to 1.1 and from 1.1 to 3. "621B" is insensitive to rf power changes over a 20-to-1 change; is equipped with matching transformers for operation with both bolometer and crystal detectors.—*Cubic Corp.*, 2841 *Canon St., San Diego* 6, *Calif.*

For more information circle **527** on inquiry card.

Audio Sweep Generator

Three models of a new audio sweep generator contain a beat-frequency oscillator which makes possible automatic 'scope presentation of frequency response curves for electronic components or complete units to be tested. Frequency sweep is achieved by continuously varying sinoidal output frequency between frequency limits: "Model AB," from 20 to 200,000 cps.; "Model AC," 2 to 20,000 cps.; "Model AD," 0.2 to 2,000 cps. Linear or logarithmic sawtooth interval sweeps at 5 or 10 cps repetition rates.—*Techno-matic Instrument Co.*, 11368 *W. Olympic Blvd., West Los Angeles, Calif.*



For more information circle **528** on inquiry card.

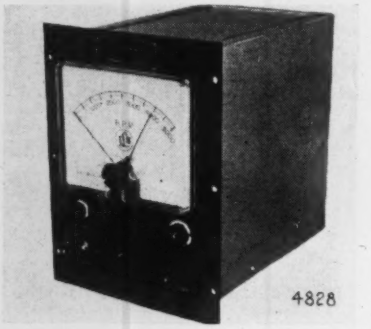
FM/AM Signal Generator

New "Model TF.995A/1" features continuous frequency coverage from 2 to 220 Mc; normal deviation continuously variable from 0 to 25 kc and 0 to 75 kc on all bands; high deviation of X2 normal also available on 2-13.5 and 27-54 Mc bands, X4 normal on 54-108 Mc band and X8 normal on 108-220 Mc band; modulation distortion less than 2%.—*Marconi Instruments*, 23 *Beaver St., New York* 4, *N. Y.*

For more information circle **529** on inquiry card.

Ignition Tachometer

New "Model 1500" for use on automotive engine test stands has built-in adjustable over-speed relay; also voltage-regulated shaping circuits to prevent ignition or power line voltage fluctuations from affecting accuracy. Range 0-5000 rpm, (others available). —*I-L-S Instrument Corp.*, 10701 *Briggs Road, Cleveland* 11, *Ohio.*



For more information circle **530** on inquiry card.

Radio Interference and Field-intensity Meter

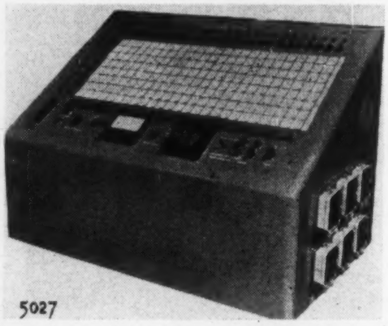
New "NM-10A" covers frequency range of 14 to 250 kc; is designed for lab or severe-service field use for field intensity measurements of carrier current systems, surveys of conducted or radiated interference, etc. Complete selection of accessories includes power supply enabling operation from 105/-125 or 210/250 vac, 50 to 1600 cps.—*Stoddart Aircraft Radio Co.*, 6644 *Santa Monica Blvd., Hollywood* 38, *Calif.*

5083
Navy Specs Water Test

For more information circle **531** on inquiry card.

Relay-system Tester

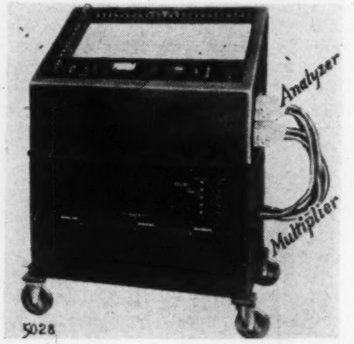
New "Model 250F Functional Tester," for testing multiple complex relay systems, has a capacity of 200 test positions with provisions for operation of a series of external relays in any of these 200 test positions. Every type of interconnected relay system can be automatically tested for errors in continuity-discontinuity and shorts. Programming board permits choice of circuit testing sequences for various combinations of n-o or n-c relay contacts.—*Dit-Mco Inc.*, 505 *W. 9th St., Kansas City, Mo.*



For more information circle **532** on inquiry card.

Circuit-analyzing Multiplier

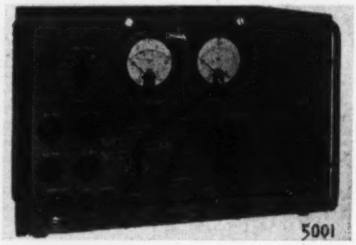
New "Multiplier Unit" for use with maker's "Model 200 Circuit Analyzer" enables users to test from 200 to 1200 complex circuits automatically at speeds up to 200 circuits in 20 seconds.—*Dit-Mco Inc.*, 505 *W. 9th St., Kansas City, Mo.*



For more information circle **533** on inquiry card.

Omnirange-system Tester

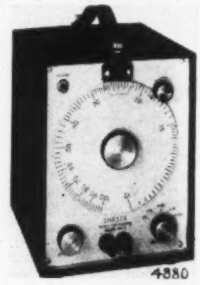
New "Type H-14A Omnirange Signal Generator" is designed to test airborne VHF omnirange/localizer receivers and to transmit signals to aircraft on airport for ramp checking; embodies major design improvements over earlier "H-14."—*Aircraft Radio Corp., Boonton, N. J.*



For more information circle **534** on inquiry card.

Audio Oscillator

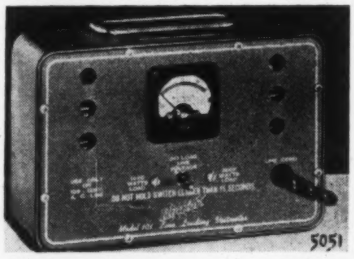
New "Model 301A" covers frequency range from 10 cps to 1 Mc in 5 steps; will drive impedances as low as 600 ohms with sufficient output to satisfy most general test requirements. Distortion less than 1%. — *Shasta Div., Beckman Instruments, Inc., P. O. Box* 296, *Station A, Richmond, Calif.*



For more information circle **535** on inquiry card.

Line Loading Voltmeter

New "Model 101" will save time for electrical appliance and installation technicians: it plugs into a standard 115-v. outlet and continuously reads line voltage; front-panel switch permits 1000- or 2000-watt line load and reads resulting ac line volt change due to load.—*The Hickok Electrical Instrument Co.*, 10528 *Dupont Avenue, Cleveland* 8, *Ohio.*



For more information circle **536** on inquiry card.

Transistor Noise Meter

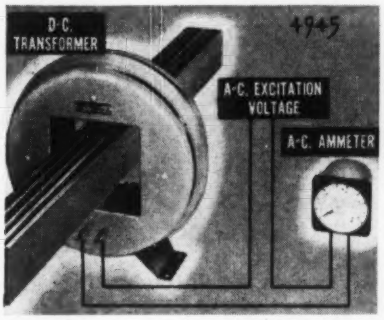
New simplified transistor noise meter, said to yield "for the first time accurate information on the noise figure of a transistor in a single simple reading by simply inserting the transistor into a socket," is not a servicing tool but for users of transistors as an incoming inspection tool because its high speed of operation makes a 100 percent inspection possible.—*Radio Receptor Co., Inc.*, 240 *Wythe Ave., Brooklyn, N. Y.*

For more information circle **537** on inquiry card.

ELECTRICAL-INSTRUMENT ACCESSORIES

Direct-current Transformer

New "Type JSU-1" direct-current transformer (formerly designated d-c. measuring reactor) makes possible continuous remote indication of large direct currents by isolating instrument circuit from d-c. circuit when making current measurements, thus also reducing electrical hazard to personnel and equipment. Can decrease installation expense since no special bolted-bus connections are necessary; lowers operating expenses owing to elimination of power drain from circuit being measured.—*Instrument Dep't, General Electric Co., West Lynn 3, Mass.*



For more information circle **538** on inquiry card.

Hook-on VAM Poles

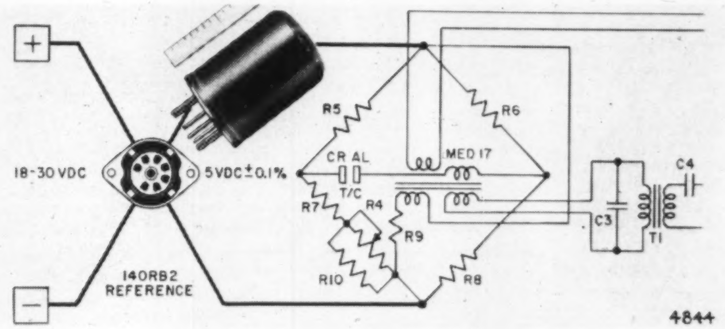
New hot-line extension poles ("amertongs") for use with G.E. hook-on volt-ammeters, made by A. B. Chance Co., Centralia, Mo., were designed at request of G.E.'s Instrument Department; maximize safety in use of changeable-scale hook-on volt-ammeters on high-power transmission lines; are available in 4-ft. or 6-ft. lengths, equipped with an angle which facilitates scale reading. Longer extensions available with hinges for easy transportation in trouble-shooter's car.—*Instrument Dep't, General Electric Co., West Lynn 3, Mass.*

For more information circle **539** on inquiry card.

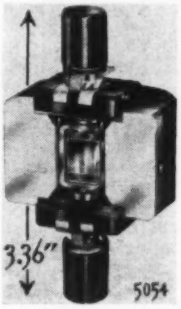
Tubeless Standard Voltage Source

New "Type 140RB2" offers accuracy of better than 0.1 percent for 20 percent change in supply. Various styles available for supply voltages as low as 12 volts and up to several hundred volts a.c. or d.c. Constant 5-volt output, with repeatability of better than 0.1% and temperature drift of, at most, 0.01% per C deg. for range of -55°C to 125°C.—*Manning, Maxwell & Moore, Stratford, Conn.*

For more information circle **540** on inquiry card.



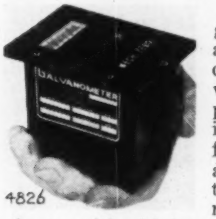
Galvanometer Elements



New light-beam galvanometer elements combine exceptional ruggedness and compactness with sensitivities up to 0.0085 ua/mm at 1 meter; short period; high-speed response; coil resistances 20, 100, 500 and 1000 ohms; 14-K gold suspension; resist up to 25 *G*'s shock and vibration.—*Howell Instrument Co., 1106 Norwood, Fort Worth 7, Texas.*

For more information circle **541** on inquiry card.

Shock-proof Galvanometer



New light beam galvanometers are available completely housed with lamp and projection system included, ready for installation and use. Exceptional compactness is achieved, along with high sensitivity (0.105 ua./mm.), through "folded" light beam whose effective length is 80 mm. Units resist up to 25 *G* shock or vibration; feature novel pointer-shaped light spot; short period; high-speed response.—*Howell Instrument Co., 1106 Norwood, Ft. Worth, Texas.*

For more information circle **542** on inquiry card.

Voltage Regulators

Two higher capacity regulators, added to maker's line of "MVR" magnetic voltage regulators, have capacities of 250 va and 500 va (previously available 15, 30, 60 and 120 va); are primarily intended for incorporation into other equipment, where performance becomes more effective when incoming line voltage is stabilized; can also be used as auxiliary stabilizers. —*Sorensen & Co., 375 Fairfield Ave., Stamford, Conn.*

For more information circle **543** on inquiry card.

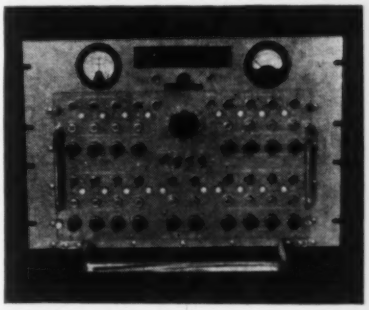
Frequency Standard

New "Model FS-185" is a highly stable source of 100-kc signals. A precision GT-cut quartz crystal is housed in an oven within an oven, both temperature-controlled. Medium-period stability (24 hours, averaged) 0.5 part in 100 million; long-period stability (2 months, averaged) 10 parts in 100 million. Other frequencies, sub-assembly units, monitoring, recording and measuring equipment available on special order.—*Teletronics Laboratory, Inc., 54 Kinkel St., Westbury, L. I., N. Y.*

For more information circle **544** on inquiry card.

Bridge-balance Unit

New automatic bridge-balance and calibrating unit is panel-mounted version of maker's portable flight and field test "Model 18-200"; fits standard racks.—*B & F Instruments, Inc., 4732 N. Broad Street, Philadelphia 41, Pa.*



For more information circle **545** on inquiry card.

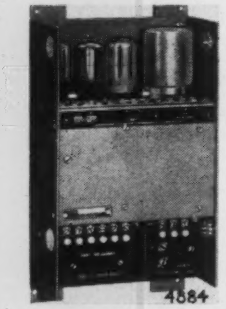
Wide-range Oscillator

New "Model 440-B Precision Push-Button Oscillator" gives 2000 frequencies, from 0.5 to 1000 cps. in ½-cps. steps. Calibration accuracy 0.05%; drift per hour less than 0.005%; distortion and hum less than 0.1% at any output level; amplitude varies less than 0.25 db over entire frequency range.—*Krohn-Hite Instrument Co., 580 Masachusetts Ave., Cambridge 39, Mass.*

For more information circle **546** on inquiry card.

AMPLIFIERS

Amplifier-converter

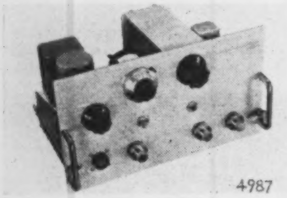


New "Type T2C Thermocouple Converter" enables maker's "Autronic" System to be used with thermocouples or other low-voltage d-c. inputs. It is a high-impedance null-balance unit which converts millivolt signals to a 60 cycle a-c signal directly proportional to variable being measured. Accuracy 0.5%, reproducibility 0.25% and ultimate sensitivity better than 0.1% of span. Power consumption 12 watts.—*The Swartwout Co.,* 18511 *Euclid Ave, Cleveland* 12, *Ohio.*

For more information circle **547** on inquiry card.

Low-level Preamplifier

New "Model 150-1500" is another specialized "front end" for maker's "150 Series Oscillographic Recording Systems." It permits measurement of extremely low voltages and currents, such as output from thermocouples, etc.—*Industrial Div., Sanborn Co.,* 195 *Massachusetts Ave., Cambridge, Mass.*



For more information circle **548** on inquiry card.

Miniature Preamplifier

New "Type 230" is a compact inexpensive accessory for use with lab 'scopes, VTVMs, frequency counters, etc. It plugs directly into input terminals having standard spacing (adaptors can be furnished for other types of connectors). Gain is 10X or 25X, over a frequency range dependent upon gain setting and input capacitance of instrument. With a DuMont "304" 'scope it gives a deflection factor of 1 mv peak-to-peak per inch.—*Owen Labs.,* 412 *Woodward Blvd., Pasadena* 10, *Calif.*

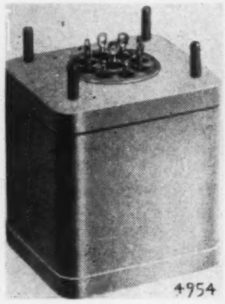
For more information circle **549** on inquiry card.

High-gain Amplifier

New "Model B L 550" is for high sensitivity dc recording; has a gain of 10,000; utilizes a chopper-stabilized feedback circuit which obviates need for matched tubes and permits extended frequency response: when used with maker's direct-writing oscillographs, frequency response is dc to 100 cps; with photographic equipment frequency range can be extended to 5000 cps. Measurement range 100 microvolts to 500 volts; maximum sensitivity in use with an oscillograph 100 microvolts per chart millimeter; drift less than 0.25 chart mm. per hour. All operating controls are located on 5¼ x 19 front panel.—*Brush Electronics Co.,* 3405 *Perkins Avenue, Cleveland* 14, *Ohio.*

For more information circle **550** on inquiry card.

Magnetic Amplifiers



New standard catalog series of magnetic amplifiers comprises stock units with wide ranges of impedance, power gain, response time and supply frequency, in hermetically sealed cases or plastic encapsulated forms. "Type 402," illustrated, is a two-stage amplifier. Power gain 2,000,000; input impedance 200 ohms; load impedance 3000 ohms; supply frequency 400 cps at 115 v; response time 1 sec.—*Hycor Co., Inc.,* 11423 *Vanowen St., North Hollywood, Calif.*

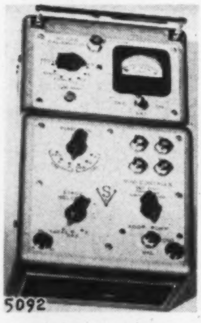
For more information circle **551** on inquiry card.

A-c Amplifier

New "Model 102A Decade Isolation Amplifier" has unusually high input impedance of 250 megohms shunted by 3 mmf, gains of 0.1, 1, 10, 100, and 1000 accurate within 2%, and frequency response of 3 cps to 300 kc.; accessory double-shielded low-capacitance probe. Cabinet or rack panel mounting—up to three units can be mounted on a 5¼ x 19-in panel. Instrument can be used as general-purpose preamplifier or as isolation amplifier ahead of VTVMs and 'scopes. It minimizes circuit-loading errors in work with many types of pickups.—*Keithley Instruments,* 3868 *Carnegie Avenue, Cleveland* 15, *Ohio.*

For more information circle **552** on inquiry card.

Low-noise Preamplifier

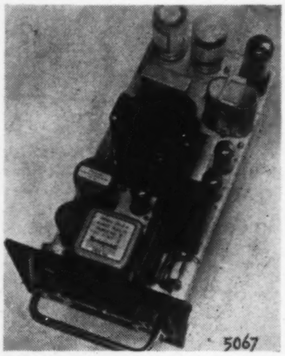


New "VS-61 A Ultra-Sensitive Low-Noise Oscilloscope Pre-amplifier," also called "Hushed Transistor Amplifier," is a highly-sensitive dual-input adding or differential amplifier, having 0.5 uv rms noise over a frequency band of 60 kc. Stage selector switch provides a choice of either straight vacuum-tube amplification (max. gain 10, input impedance 100 k, frequency response 2 cps to 250 kc) or combined transistor and vacuum tube amplification (available max. gains 200 and 1000, input impedance 1k, frequency response 2 cps to 60 kc).—*Volkers & Schaffer Mfg. Corp., Box* 996, *Schenectady, N. Y.*

For more information circle **553** on inquiry card.

Proportional Amplifier

New "2 HLA-4," for use as a recorder preamplifier or as a control-system amplifier, features interchangeable plug-in range units; full-scale voltage ranges as low as 100 uv; gain as high as 10^5; linear response within 1% from dc to as high as 80 cps.—*Doelcam Div., Minneapolis-Honeywell, Soldiers Field Road, Boston* 35, *Mass.*

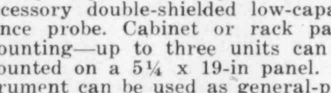


For more information circle **554** on inquiry card.

POWER SUPPLIES

"Stackable" Supplies

New "S-100-R," said to be "ideally suited for laboratory use," has basic output range of 200-325 v. at 0-100 ma. Two, three or four units can be "stacked" in parallel to furnish up to 0-400 ma. "Hogging" of load by one supply is prevented by a unique circuit feature permitting several units to be interconnected so that one error amplifier controls all pass-tubes in use while the other error amplifiers remain inactive; also permits use of one voltage control to set all supplies to desired output.—*New Jersey Electronics Corp.,* 345 *Carnegie Avenue, Kenilworth, New Jersey.*



For more information circle **555** on inquiry card.

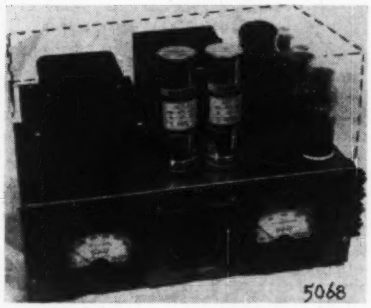
D-c. Power Supply

New "Model UHR-240 Regulated Power Supply provides up to ½ amp. at 0 to 500 v.dc. with 0.001% regulation and less than 100 microvolts of ripple. Stabilization for 10% change in line voltage is better than 0.003 percent. Transient response is 0.001 millisecond. Typical ten-hour drift is 300 ppm. plus 20 mv.—*Krohn-Hite Instrument Co.,* 580 *Massachusetts Ave., Cambridge* 39, *Mass.*

For more information circle **556** on inquiry card.

Industrial Power Supply

New "Model IPS-EC-1 and IPS-EC-2" is suitable as a constant-level power supply for industrial electronic control systems or universal power supply for research labs. Input 115 vac at 60 cps; output 80 to 460 vdc at 200 ma and 6.3 vac at 6 amps. Photo shows it without cabinet, standby switch and indicator lights.—*Morrow Products Co.*, 550 *Grant St., Pittsburgh, Pa.*



For more information circle **557** on inquiry card.

Twin Transistor Supply

New "Model TR-200AT" dual output dual-range precision-regulated dc supply was developed specifically for use in transistor circuit development. Output of each transistor supply is 0 to 10 v and 0 to 100 v; also two 8.amp. outputs at 6.3 v ac. Two voltmeters with dual ranges from 0 to 10 v and 0 to 100 v and two ammeters with ranges from 0 to 200 ma. Dimensions 8¾ x 19 in. for rack mounting; cabinets available.—*Universal Electronics Co., New Products Div.*, 2012 *S. Sepulveda Blvd., Los Angeles* 25, *Calif.*

For more information circle **558** on inquiry card.

Lab Power Supplies

New power supplies provide flexibility of use necessary for experimental work with klystrons, traveling-wave tubes, and other microwave devices; feature 50-kv. isolation from ground on both sides of h-v. circuit so that several units can be operated in series where desired. Two models have continuously-variable outputs from 0 to 1000 v. and from 0 to 2000 v. at 200 ma.; larger-capacity units up to 50 kv. are available.—*Levinthal Electronic Products, Inc.*, 2905 *Fair Oaks Ave., Redwood City, Calif.*

For more information circle **559** on inquiry card.

Regulated Supply for Pulse Equipments

New "Model 9201" simplifies assembly of small pulse test and control systems containing as many as five units, is about half the size and one third the cost of maker's larger power supplies, is sized for mounting together with pulse control units in standard 19-in relay racks. It provides six regulated d-c voltages as well as 6.3 v.ac to as many as five different pulse control units. With line input of 115 v.±5%, regulation on all d-c outputs is 5%; ripple voltage less than 0.5%.—*Electronic Instruments Div., Burroughs Corp.*, 1209 *Vine St., Philadelphia* 7, *Pa.*

For more information circle **560** on inquiry card.

Regulated Supplies

New "Models UP520B and UP530B" feature regulation of better than 0.005%, obtained by a combination of magnetically stabilized ac line source for externally regulated reference supply, incorporation of new high-stability reference tube "Type 85A2," and a total of five stages of drift-cancelling differential amplifiers with magnetically stabilized heaters. Bias supply range 0 to –150 v continuously variable at 0 to 5 ma; also output voltage at a fixed negative potential of –300 v at 0-50 ma.—*Universal Electronics Co.*, 1720 *22nd St., Santa Monica, Calif.*

For more information circle **561** on inquiry card.

Dual Power Supply

New "Model S-2300" comprises two heavy-duty power supplies, each capable of 200 to 300 volts at 0-300 ma. New and unique switching principle permits front panel selection from four modes of operation: Series Aiding, 400-1000 v, 0-300 ma, grounded either polarity or anywhere between the two ends; Parallel, 200-500 v, 0-600 ma, grounded either polarity, with automatic control of all pass-tube grids from one of the two error amplifiers; Series Bucking, 0-300 volts at 0-300 ma, grounded either polarity, with means to permit full pump-back and efficient hum cancellation; Isolated, two independent supplies which may be operated in any polarity, up to 1500 v. apart. "S-2300" is available in rack or cabinet style, with or without four indicating instruments.—*New Jersey Eectronics Corp.*, 345 *Carnegie Avenue, Kenilworth, N. J.*

For more information circle **562** on inquiry card.

ELECTRICAL and ELECTRONIC COMPONENTS

Coaxial Triodes

New "ML-6426" and "ML-6427" coaxial-terminal triodes employ thoriated-tungsten filaments; are for industrial and broadcast equipments of 25-50 kw power output; provide considerably improved performance ratings, safety margins and strength over tubes heretofore available. New thoriated-tungsten filaments greatly reduce power requirements while offering life increases to 100%.—*Machlett Labs., Springdale, Conn.*

For more information circle **563** on inquiry card.

HF Transistors

New improved transistors (made by new "meltback" process) can be used in TV, radar, and other devices where high-frequency requirements previously required vacuum tubes. "Meltback" process minimizes impurities in germanium or silicon crystals from which transistors are made. New transistors also have greatly improved gain characteristics; amplification of current with ordinary transistors usually is about 50 times; with new transistors current gains of several hundred are typical and results in the thousands have been achieved.—*Electronics Div., General Electric Co., Syracuse, N. Y.*

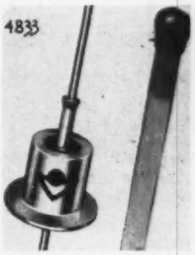
For more information circle **564** on inquiry card.

Miniature Transistors

New germanium transistors, said to be "the smallest and lowest-priced available," are 0.2-in. square and ⅛-in. thick.—*Radio Receptor Co.*, 240 *Wythe Ave., Brooklyn, N. Y.*

For more information circle **565** on inquiry card.

Germanium Diodes



New germanium diffused-junction power diodes are said to offer exceptionally low leakage and high rectification efficiency. Reliability results from hermetic sealing of housing: glass-to-metal and welded metal-to-metal seals throughout. Standard types available from production.—*Semiconductor Div., International Rectifier Corp., El Segundo, Calif.*

For more information circle **566** on inquiry card.

Silicon Power Rectifiers

Transitron
5089

New high-power silicon rectifiers are said to "provide, for the first time, reliable operation under wide variations in ambient temperature . . . efficiencies of 90% to 99% . . do not exhibit aging effects." 125°C ratings from 10 amps at 50 v piv to 5 amps at 200 piv.—*Transistron Electronic Corp., Melrose, Mass.*

For more information circle **567** on inquiry card.

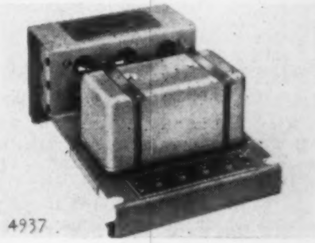
Voltage and Frequency Regulators

New line of "VF Controls" is made up of inexpensive integrated packages for precise regulation of both voltage and frequency of motor-alternator sets and inverters. Standard units regulate voltage and frequency to better than 2%; special models to 0.25%.—*Electric Regulator Corp.*, 314 *Pearl St. Norwalk, Conn.*

For more information circle **568** on inquiry card.

Industrial Regulator

New "Size 4 Regohm" is a direct-action finger-type electric circuit con-



trol regulator; supplements lower-power "Regohm Sizes 1 and 3."—*Electric Regulator Corp., 604 Pearl St., Norwalk, Conn.*

For more information circle **569** on inquiry card.

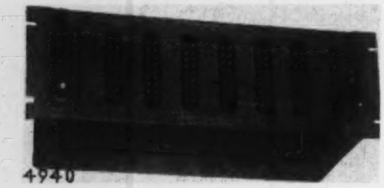
Variable Delay Networks

New series of variable delay networks for laboratory use are constructed for front panel mounting, provide variable delay from 0 to 0.75 usec. in ten turns of vernier control shaft.—*E.S.C. Corp., 534 Bergen Blvd., Palisades Park, N. J.*

For more information circle **570** on inquiry card.

Precision Delay Line

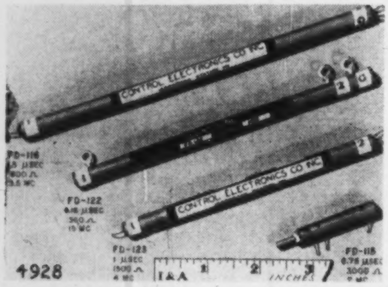
New "Model DL 0510/400/125," for correlation measurements and waveform analysis covering sub-audio and audio frequencies, has over-all delay of 5,000 usec; characteristic impedance 510 ohms; calibration accuracy at each of 125 taps 0.1 usec; insertion loss 1.7 db; cut-off frequency 9 kc; phase linearity 1% up to 5 kc.—*Epsco, Inc., 588 Commonwealth Ave., Boston, Mass.*



For more information circle **571** on inquiry card.

Miniature Delay Lines

New "FD Series" miniature distributed-constant delay lines, for use in computers, 'scopes, etc., are available in a wide choice of performance characteristics and sizes with bandwidths to 30 Mc, impedances 200 to 5000 ohms, and delays up to 4 usec in a 6-inch stick; can be cascaded for longer delays.—*Control Electronics Co., Inc., 1925 New York Ave., Huntington Station, N. Y.*


CONTROL ELECTRONICS CO INC
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FD-116
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4928

For more information circle **572** on inquiry card.

Pulse-forming Networks

New hermetically-sealed "GPEN-3K-5 Pulse Expanding Network" units will generate, in a simple circuit, a 5-usec pulse with input pulse widths from 0.05 to 2 usec. Output amplitude can be made to follow input amplitude variations or to change in proportion to input pulse duration. Size 1 x 1 x 1½ in.—*The Gudeman Company of California, Inc., 2661 S. Myrtle Ave., Monrovia, Calif.*

For more information circle **573** on inquiry card.

Pulse-forming Network

New "No. 11-54 Dual Pulse Forming Network," which forms two 0.6 usec pulses at 12 ohm impedance and 500 vdc working, affords maximal efficiency in minimal space: 1⅝ x 1¼ x 1⅛ in.—*E. S. C. Corp., 534 Bergen Blvd., Palisades Park, N. J.*

For more information circle **574** on inquiry card.

Adjustable Inductors

Adjusto
TYPE A
Burnell & C
4919

New models of "Adjustoroid" allow inductance to be varied by a simple screwdriver adjustment. Variation normally is 10% of nominal value for 180° rotation (in some models as high as 20%). Once set, inductance value is extremely stable, little affected by changes in temperature and other conditions.—*Burnell & Co., Yonkers 2, N. Y.*

For more information circle **575** on inquiry card.

Carbon-film Resistors

New line of carbon film resistors, in ¼, ½, 1 and 2 watt ratings, covers resistance range of 10 ohms through 20 meg. Tolerances 1%, 2% and 5%. Moderate cost. Meet requirements of MIL-R-10509A.—*Continental Carbon, Inc., 13900 Lorain Ave., Cleveland 11, Ohio.*

For more information circle **576** on inquiry card.

Industrial VDRs

New "P Series" voltage-dividing resistors are low-cost molded Bakelite units for automation and industrial applications. Available in single or ganged assemblies in three sizes, P3, P1⅝, and P1¼ (numeral identifies diameter) they are said to feature high standards of accuracy, low noise, long life, low torque, minimized distributed capacitance, excellent frequency response, and high stability.—*Technology Instrument Corp., Acton, Mass.*

For more information circle **577** on inquiry card.

Wire-wound Controls

New design feature is announced for "Series MH Controls," namely a wiper arm insulated from shaft and mounting bushing. Rated at 1 watt and available in resistance values from 2 ohms to 1 kilohm.—*Clarostat Mfg. Co., Inc., Dover, N. H.*

For more information circle **578** on inquiry card.

0.1-Watt Resistor

New "Type TR," 0.140 in. long and 0.015 in. diameter with 1-in. leads is rated at 0.1-watt; is a molded composition unit with an insulating coating, especially suitable for use with transistors and diodes in miniaturized equipment. Available in standard RETMA, JAN-R-11, and MIL-R-11 resistance values for standard tolerances of 5%, 10%, and 20% from 10 ohms to 22 megohms.—*Allen-Bradley Co., 1326 S. Second St., Milwaukee 4, Wis.*

For more information circle **579** on inquiry card.

Power Resistors

New "Type MP" and "Type CMP" lead-mounted miniature precision power resistors are said to offer attractive space, weight, and cost savings over conventional types for both commercial and critical military applications; can be mounted by their axial leads, obviating need for brackets or supplementary insulation. Resistances from 10 to 50,000 ohms. Power ratings 3, 5, 7 and 10 watts, based on a "hot spot" temperature of 275 C at ambients of 40 C.—*Shallcross Mfg. Co., Collingdale, Penna.*

For more information circle **580** on inquiry card.

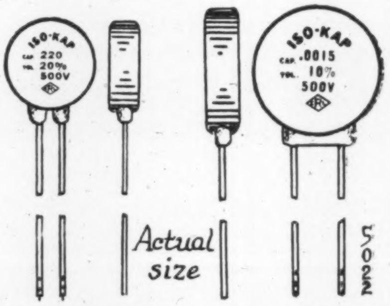
Deposited-carbon Resistors

New "Fixtohm" deposited-carbon precision resistors meet government and other critical specs. Pure crystalline carbon is deposited on a ceramic insulator by a thermal decomposition of a hydrocarbon. Higher resistance values are attained by spiral-cutting through coating. Resistance element is protected either by multiple layers of insulating, moisture-resistant varnishes separately baked on, or by hermetic sealing in an imprevious steatite shell. On special order, plated brass shell with glass end-seals.—*Campbell Industries, Inc., Chattanooga, Tenn.*

For more information circle **581** on inquiry card.

Ceramic Disc Capacitors

New "Iso-Kap" molded disc ceramic capacitors feature extraordinary temperature stability between −55°C and 85°C, completely insulated molded case with 3000-vdc minimum breakdown to ground; meet MIL-C-11015A, JCNAAF-C-26 and RTMA REC-107A.—*Dep't D-19, Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.*



For more information circle **582** on inquiry card.

Smallest Mica Capacitor

New dipped-mica "Dur-Mica DM-15," said to be "the world's smallest mica capacitor and the first mica capacitor with parallel leads," is rated at 1 to 510 mmf at 300vdcw and up to 400 mmf at 500vdcw; capacitance

Actual size
4939

tolerance ½% or 0.5 mmf (whichever is greater); meets all RMA and MIL-C-5 specs for regular capacitors.—*Electro Motive Mfg. Co., Inc., Willimantic, Conn.*

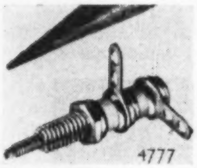
For more information circle **583** on inquiry card.

Paper Capacitors

New line of rectangular subminiature metallized paper capacitors features new lead locations: axial leads, radial leads and single-end parallel leads. Available in all sizes of capacitors as well as on special units.—*Hopkins Engineering Co., 2082 Lincoln Ave., Altadena, Calif.*

For more information circle **584** on inquiry card.

Differential Capacitor



New "CST-50-D" miniaturized differential capacitor, for circuits where balancing is required, features a single tuning element of unusual design to minimize air dielectric loss. Range of top half of unit is 1.5 to 10 mmf.; of bottom half 5 to 10 mmf. Terminals have two soldering spaces. Locking nut affords stability with no capacitance change.—*Cambridge Thermionic Corp., Cambridge, Mass.*

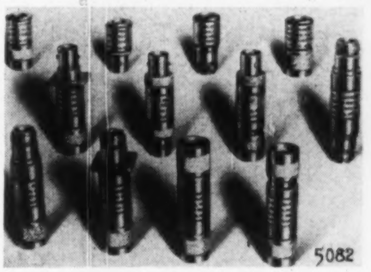
For more information circle **585** on inquiry card.

High-temp Capacitor

New "HT-4" capacitor has been run continuously for 17000 hours at 200 C and 140% of rated voltage without deterioration. Average change in capacitance is less than 2% after repeated cycling from room temperature down to −70°C, up to 200°C and back to room temperature. Insulation resistances as high at 10^{14} ohms are available, are said to enable new capacitors to hold a charge for "the longest time of any known capacitor in commercial use." Power factor is less than 0.05% from 0 to VHF band (Q of 2000). In UHF band, Q is as good as mica. Standard ratings are 0.0001 to 4.0 mfd; voltage ratings 200 to 1000.—*Balco Research Labs., 49 Edison Place, Newark 2, N. J.*

For more information circle **586** on inquiry card.

Coax Pads & Terminations

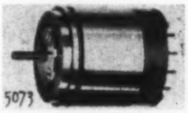


New line of coaxial attenuator pads and line terminations features Type C and N connectors; permits any conceivable combination of the two styles. Characteristic impedance is 50 ohms; attenuation available in any value from 0.1 db to 60 db.—*Stoddart Aircraft Radio Co., Inc., 6644 Santa Monica Blvd., Hollywood 38, Calif.*

For more information circle **587** on inquiry card.

ELECTROMECHANICAL COMPONENTS

Precision Resolver



New "Type 3D-2348" size-15 boosterless resolver, designed for phase shifting and interchanging rectangular and polar coordinates in computer applications, obviates need of associated amplifiers and compensators because of small variation in transformer ratio and phase shift with varying input voltage. Axis misalignment is 7 minutes and maximum angular error 0.12%. Input voltage 0 to 16 @400 cps. Unit is available with terminal connectors.—*John Oster Mfg. Co., Avionic Div., 1 Main St., Racine, Wis.*

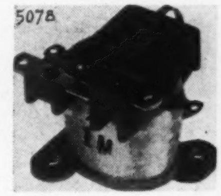
For more information circle **588** on inquiry card.

Synchronous Motors

New "Type SMY" synchronous inductor motors featuring slow-speed synchronous operation, instantaneous acceleration and deceleration, and instantaneous reversing, are available in torque ratings of 75 and 2 oz-in at 60, 50, and 25 cps; are suitable for recording devices, industrial process timers, etc., and their low speed and rapid deceleration make them suitable also for applications which previously required either a gear-motor, brake motor, or both.—*Specialty Component Motor Dep't, General Electric Co., Schenectady 5, N. Y.*

For more information circle **589** on inquiry card.

Simplified Relay



New "Type 11F" is a small spdt relay designed to sell in quantity for as little as 75 cents for use in such devices as radiosondes, automatic headlight dimmers, radio-controlled toys, etc. Tentative specifications: 50 mw operate (24 ma in 9000-ohm coil); 1 amp max contact load; up to 9000-ohm coil resistance.—*Sigma Instruments Inc., 81 Pearl Street, So. Braintree, Boston 85, Mass.*

For more information circle **590** on inquiry card.

Aircraft Gyro Motors

New "Type GAA" hysteresis-type motors for position or rate gyros feature increased torque reserve (for applications requiring low-temperature starting without heaters) and rigorous control of inertia during manufacture to provide rated angular momentum within 0.5%; are rated 100,000 gram-cm.^{2} radians/sec. at 12,000 rpm.; designed for 10-v. 3-phase 400-cps. supply. Weight 76.4±1.5 grams; over-all length, including mounting shaft, 1.290 in.; wheel diam. 1.555 in.—*Westinghouse Electric Corp., Aircraft Dep't, Lima, Ohio.*

For more information circle **591** on inquiry card.

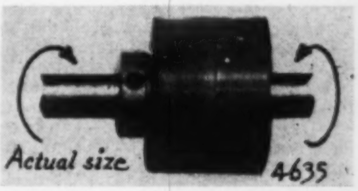
Induction Motor

New "Model D7302" distributed wound induction motor, designed for recorders and other commercial and military applications, is rated ⅛ to 1/100th h.p.; is available in 2-, 4-, 6-, 8- and 12-pole versions, single and dual speed combinations in standard induction and synchronous types.—*Howard Industries, Inc., Racine, Wis.*

For more information circle **592** on inquiry card.

Magnetic Clutch

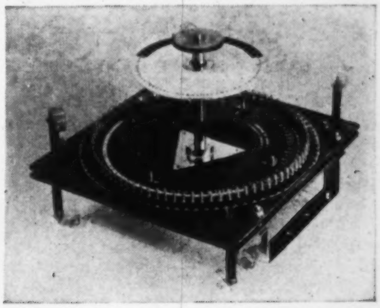
New "Direct In-line Drive" model is added to "500 Series" miniature magnetic clutches, besides gear and cable drives. All drives are available in three models, two for continuous rotation (multi-turn) and one for single-turn adjustment. Operating voltages from 6 to 30 d.c. or rectified a.c. (6 and 28 volts from stock).—*Electronic Mfg. Engineers Co., 2410 Beacon Ave., Seattle 44, Wash.*



For more information circle **593** on inquiry card.

Multiposition Switches

New switches for special applications are of instrument-quality type. Among them is an 81-position 2-circuit continuous-rotation model good for over 50,000 operations, with individually spring-loaded silver-plated contacts. Voltage breakdown about 1500 v.dc.—*Industrial Instruments, Inc., Cedar Grove, N. J.*



For more information circle **594** on inquiry card.

Thermal Delay Relays

New "Series H" relays provide time delay intervals from 0.1 sec. up to 5 sec. (shorter than those provided by

G-V
HOT WIRE
TIME DELAY
RELAY
4950

conventional thermal relays and longer than those feasible with slow-acting magnetic relays); utilize hot-wire operating principle; are completely hermetically sealed but have time delay intervals adjustable by means of a screw accessible from top. Standard energizing voltages 6.3 to 28 dc or ac of any frequency.—*G-V Controls Inc., 28 Hollywood Plaza, E. Orange, N. J.*

For more information circle 595 on inquiry card.

Smallest Two-amp Relay

New hermetically-sealed microminiature relay for aircraft use, believed to be the smallest of its rating ever developed, is less than 1 in. high, weighs 10 grams; has contact rating of 2 amp resistive load at 30 vdc or 115 vac, is rated for operation at 1.5 milliseconds. Beryllium copper contact springs hold their adjustment during temperature cycling and storage. Shock rating over 50 *G*. Various terminal types and mounting brackets.—*Specialty Control Dep't, General Electric Co., Schenectady 5, N. Y.*

For more information circle **596** on inquiry card.

Motor Control Relay

New "Series 210-UM" magnetic motor controller a-c. relay is available in any standard arrangement of contact combinations. Coil voltage is 115 v. 60 cycles; contacts are rated at 115 v. single phase, ¼ h.p. Full U. L. approval. Standard d-p.d-t. unit weighs 4.3 oz.—*Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago 12, Ill.*

For more information circle **597** on inquiry card.

Vibrator Transformers

Two new 12-v. vibrator transformers: "Model P-2860" is exact replacement for 1955 Allstate and Chevrolet car radios; "Model P-2861" for Chevrolet, Oldsmobile, Philco and Pontiac car radios.—*Merit Coil & Transformer Corp., 4427 N. Clark St., Chicago 40, Ill.*

For more information circle **598** on inquiry card.

Servo Amplifier

New "R40G7W6" is a combination silicon-transistor and magnetic servo amplifier. It will deliver full power to parallel-connected control windings of 400-cps BuOrd MK7 or MK14 servomotors. Over-all voltage gain when driving MK7 is greater than 2000. This, coupled with wide bandwidth (0 to 70 cps.) makes new unit useful in instrument servo systems. Use of silicon transistors for preamplifier allows operation at ambients up to 85°C.—*Polytechnic Research & Development Co., Inc., 202 Tillary St., Brooklyn 1, N. Y.*

For more information circle **599** on inquiry card.

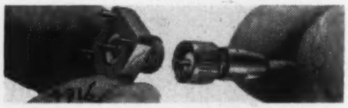
Coax Plugs

New "QC Series" are said to be "World's first and only quick-connect plugs in microminiature size for coax circuitry" with 50-, 70- and 93-ohm types offering over two million coax circuitry design possibilities: jacks, feed-throughs, bulkhead receptacles, adapters for BNC, ell, tee, cross adapters and many specials. Life guarantee over 100,000 engagements. Characteristic impedance 50 ohms nominal; insulation resistance over 100,000 megohms; capacitance 2 mmf.; rating 600 volts rms.—*Microdot, 1826 Fremont Ave., S. Pasadena, Calif.*

For more information circle **600** on inquiry card.

Graphic-circuit Coax Cable Connector

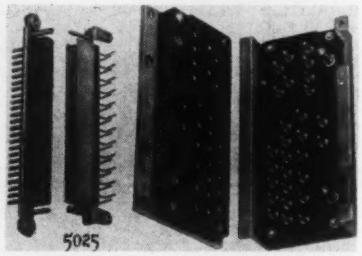
New "EC Series" miniature graphic circuit connector consists of a coaxial plug assembly and a receptacle that can be mounted on a printed or etched card by five terminal points using solder dip method.—*H. H. Buggie, Inc., 726 Stanton St., Toledo, Ohio.*



For more information circle **601** on inquiry card.

Special-design Connectors

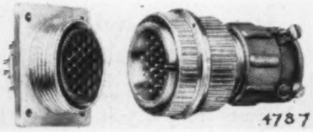
New complex special-design "Continental Connectors" are available on a mass-production basis by reason of new facilities doing away with many steps previously required.—*Electronic Sales Div., DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.*



For more information circle **602** on inquiry card.

Miniature AN Connector

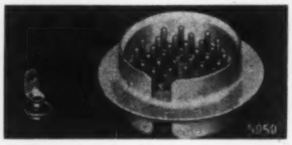
New "Series 1300" meets military requirements for precision AN-type connectors of rugged electrical and mechanical construction; features one-piece molded inserts to prevent moisture traps and electrical breakdown. —*DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.*



For more information circle **603** on inquiry card.

Terminals and Headers

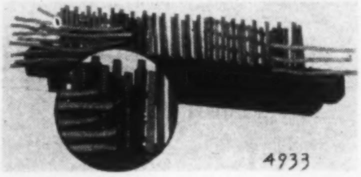
New complete line of compression type terminals and headers includes many shapes and styles heretofore unavailable.—*The Hermaseal Company, Inc., Elkhart, Ind.*



For more information circle **604** on inquiry card.

Graphic-circuit Connector

New graphic-circuit "Continental Connector PCW-22," developed originally for computer applications, can handle 132 solderless connections with 24-gage wire. Illustration shows three wires wrapped around each of 44 contacts (two rows of 22 contacts each). —*DeJUR-Amsco Corp., 45-01 Northern Blvd., Long Island City 1, N. Y.*

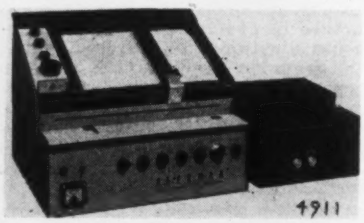


For more information circle **605** on inquiry card.

LABORATORY EQUIPMENT

Ratio-recording Spectrophotometer

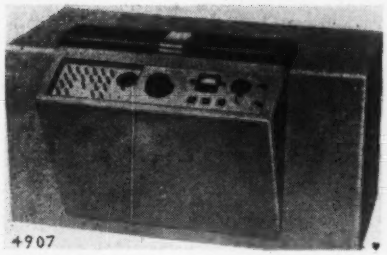
New "DK-2," based on maker's "DU" quartz monochromator, features an extended range of 200 millimicrons to 3 microns plus recording linear in transmittance, linear in absorbance or direct in energy; utilizes true double-beam optical system with a single photodetector and ratio recording. This is said to be "the most linear and accurate double-beam system known and provides maximum sensitivity for differential recording." Wide selections of recording speeds and of absorption cells.—*Beckman Div., Beckman Instruments, Inc., Fullerton, Calif.*



For more information circle **606** on inquiry card.

Spectrochemical Source

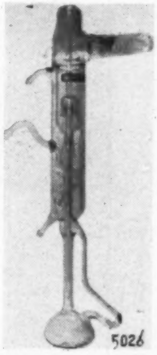
New improved model of "Multisource" unit is more flexible and versatile for a wider variety of analytical problems. Solids, liquids and powders, with elements in wide ranges of concentration, can be analyzed. Optimal excitation conditions can be established. High and low voltage circuits and dc arc elements are each packaged and wired separately. Thus, "Multisource" can perform as a special-purpose or as a general-purpose assembly through addition or subtraction of components. Unique principle for ob-



taining identical powers in each spark gives unit exactly-reproducible voltage range of 850 to 20,000.—*Applied Research Labs., Glendale, Calif.*

For more information circle **607** on inquiry card.

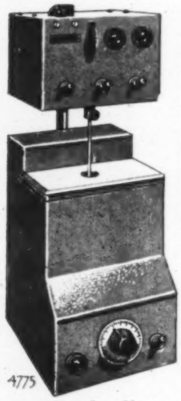
Diffusion Pump



New "Delmar-Van Hespen 2-stage Mercury Diffusion Pump" was designed to have these advantages: high vacuum, compactness, built-in fore pump condenser, economical use of mercury, and moderate speed.—*Dept. GS-7050, Delmar Scientific Labs., 1551 N. Cicero Ave., Chicago 51, Ill.*

For more information circle **603** on inquiry card.

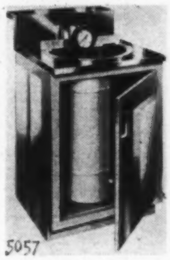
Gelometer



New "Castor Gelometer," for automatic determination of gelation time or stability of polyesters and phenolics, features an oscillator, sensitive from 5,000 to 50,000 centipoises, which automatically stops a timer when a desired viscosity range is reached. Constant-temperature bath ranges from ambient to 212°F. No clean up time is required as test tubes and oscillator strip are simply discarded after use.—*Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Penna.*

For more information circle **609** on inquiry card.

Reid-bomb Baths



New "Reid Vapor Pressure Test Baths," in furniture type cabinets, are made to accommodate 3 or 5 Reid bombs. Large hole in "Super-chemstone" cabinet top to suspend bath flush with top. Bath is equipped with preset sealed 100°F regulator, and immersion heater.—*Labline, Inc., 3070 W. Grand Ave., Chicago 22, Ill.*

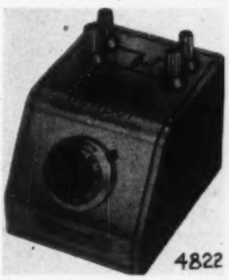
For more information circle **610** on inquiry card.

Stirrer & Hot Plate

New "Combination Magnetic Stirrer and Hot Plate" utilizes a pulley and belt drive to rotate permanent Alnico magnet, thus affording widest possible range of stirring speeds. This new principle is particularly effective when low speeds are required. Stirrer and heater can function separately when desired. Fast-action 750-watt heater is a ring-type unit completely enclosed, clamped to underside of 8-in. removable polished aluminum top. Heating is effectively controlled at set temperatures (to 700°F) by a continuously-variable thermostat. Over-all height 8½ in, weight 14½ lbs. —*Will Corp., Rochester 3, N. Y.*

For more information circle **611** on inquiry card.

Lab Variable Resistor

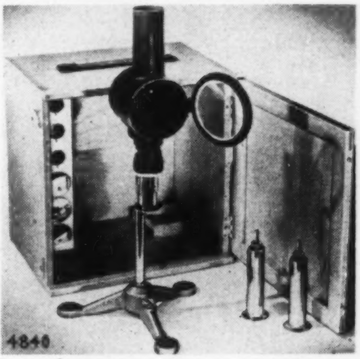


New "Series T-10-A," specifically designed for laboratories, features fast setting to desired value and positive locking; can be used as either a voltage divider or rheostat; requires one-fifth the time of a 5-dial decade box. Total resistance from 100 to 100,000 ohms. High resolution, with 1% resistance and 0.1% linearity tolerances, is provided by a "Series A" ten-turn VDR. Power rating 6.9 watts at 25°C ambient, 5 watts at 40°C ambient.—*Helipot Corp., 916 Meridian Ave., South Pasadena, Calif.*

For more information circle **612** on inquiry card.

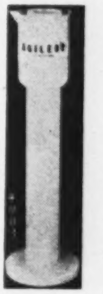
Smoke-point Apparatus

New "Labline-Seta Smoke Point Apparatus" for jet fuel tests ASTM D 1322 is made by Stanhope Engineering Co., England, according to ASTM specifications; also meets IP 57 Standards. Antiparallax gage, as used on ASTM D 219, can be supplied.—*Labline, Inc., 3070 W. Grand Ave., Chicago 22, Ill.*



For more information circle **613** on inquiry card.

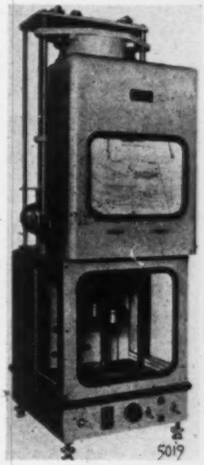
Hydrometer Jars



New spill-proof polyethylene hydrometer jars have spillage reservoir which catch any overflow. When tests are completed, entire contents are dumped back into master mix. Accordingly, there is no waste, no chance of acid damage. Two sizes: "PHJ-300," 12 in. high, 1½-in. body diameter and 3-in. top diameter, weight 11 oz; "PHJ-400," 15 in. x 1½ in. x 3 in., weight 15 oz. Made of polyethylene, jars will not break, are chemically inert, washable, and non-toxic.—*American Agile Corp., P. O. Box 168, Bedford, Ohio.*

For more information circle **614** on inquiry card.

Recording Thermo Balance

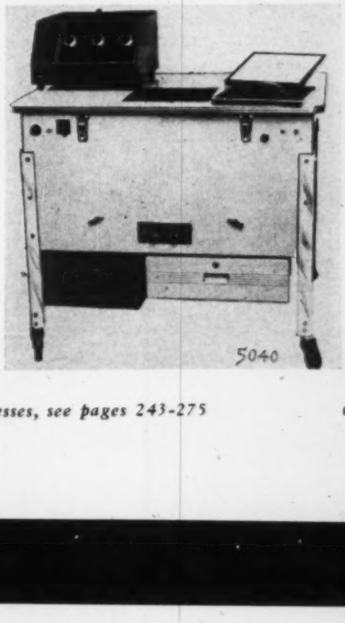


New "Stanton Thermo Balance" provides combined heating and weighing of materials under test and inks a continuous record of all changes. Neither auxiliary equipment nor photographic developing is required. Heating chamber, initially at top, is lowered around sample charge. Timer operates arresting mechanism at known time intervals, registering time on chart. Other features include automatic electric weight adding, choice of models with 1-mg or 0.1-mg sensitivity, full air-damping, insensitivity to vibrational disturbance.—*Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Penna.*

For more information circle **615** on inquiry card.

Colorimeter

New "Large-area Automatic Color and Color-difference Meter," for measuring whiteness and cleanness of naturally soiled fabrics and optical brighteners, features 10x12-in specimen exposure head, and ultraviolet type lamps as a means of determining effect of optical brighteners in



dyed material. It minimizes human element owing to its automatic servo feature. It is fast: both sides of 100 different test pieces can be easily measured by a non-professional operator in an hour's time—*Gardner Laboratory, Inc., Bethesda 14, Md.*

For more information circle **616** on inquiry card.

Molecular Filter

New high-rate molecular filter makes possible filtration of up to 250 ml. per hour, "more than 100 times the rate possible with any comparable type of laboratory filter available," utilizes, an extremely thin cellulosic membrane (about 0.0015 in.) in the form of a long tube. Membrane contains extremely fine pores (about 10 millimicrons), is restrained by a strong cotton braided tube so that liquid can be forced through it under high pressure (up to 100 psig.). Supplied only for laboratory use at present; later in larger units for plants.—*The Emil Greiner Co., 20-26 N. Moore St., New York 13, N. Y.*

For more information circle **617** on inquiry card.

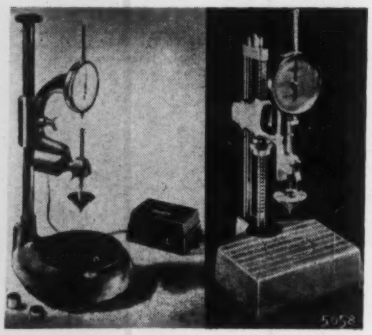
pH Meter

New line-operated "Model 110" features 7-in. scale-length indicator covering entire pH range from 0 to 14 without switching and without reversal of pointer travel. Accuracy 0.02 pH. Can also be furnished in a portable model with baseboard and carrying cover. Available accessories include a swing-arm adapter for immersing electrodes by tilting motion and a shielding hood for use of unshielded electrodes.—*Photovolt Corp., 95 Madison Ave., New York 16, N. Y.*

For more information circle **618** on inquiry card.

Grease-penetration Cone

New Grease Penetration Cone (developed by Standard of Indiana Research Labs) is made of magnesium, with stainless steel tip; weighs 102.5 grams; will run all grease tests where present ASTM brass grease cone is used, plus additional tests requiring penetration up to 61.5 mm in semi-fluid greases.—*Labline, Inc., 3070 W. Grand Ave., Chicago 22, Ill.*



For more information circle **619** on inquiry card.

Bottle Shakers

New "Gyroblend Multi-purpose Bottle Shakers" are said to provide "wrist-watch" mixing, gentle-to-violent action, and quiet operation. Snap-spring feature accommodates 4, 6, or 8 standard or odd-shaped bottles of 500 to 1000 ml. capacity, as well as pint-sized fruit jars. Adjustable drive: 428 to 750 shakes per minute. Automatic timer allows continuous operation or cycles from 1 min. to 1 hr. (optional timer 0-5 hrs.). Floor space 15 x 15 in.; weight 110 lbs.—*Gardner Laboratory, Inc., 4747 Elm St., Bethesda 14, Md.*

For more information circle **620** on inquiry card.

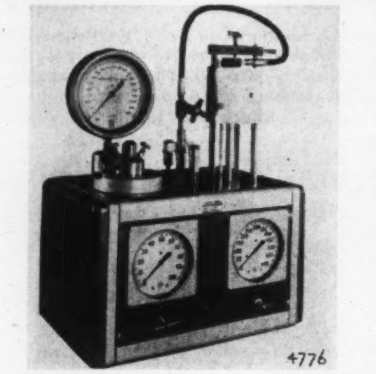
Laboratory Dual Supply

New "D50-05B" is a low-voltage low-current dual-output high-precision regulated power supply for laboratories. Output is 0-50 volts at 50 ma per side. Regulation from no load to full load is better than 0.1%; output impedance less than 1 ohm at dc; output ripple 3 mv or better. Each side can be operated independently of the other. Outputs are monitored for both current and voltage. Chassis fits standard rack.—*Dressen-Barnes Corp., 250 N. Vinedo Ave., Pasadena 8, Calif.*

For more information circle **621** on inquiry card.

Micro Rheometer

New "Model 500 Castor-Severs Micro-Rheometer," said to be "the only instrument available for measuring viscosity in small quantities of material," has a capacity of 0.7 ml. and will handle as little as 0.1 ml. of liquid. Temperature range from room to 300° C; usable pressures to 3000 psi. Viscosities can be determined accurately from one centipoise to 5 billion centipoises.—*Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Pa.*



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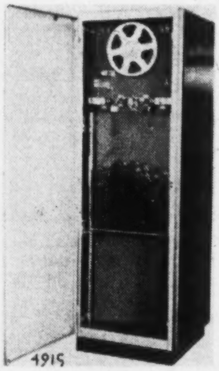
COMPUTING and DATA-PROCESSING

Tape Transport



New "Datacord" is suitable for use as an auxiliary memory storage device in computers or data reduction systems; features tape speed of 75 ips in either direction and start and stop time of about 0.004 sec; accommodates tape widths from 0.25 in. to 2 in.; has provisions for lateral and azimuth position of magnetic head.—*Brush Eectronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.*

For more information circle **623** on inquiry card.

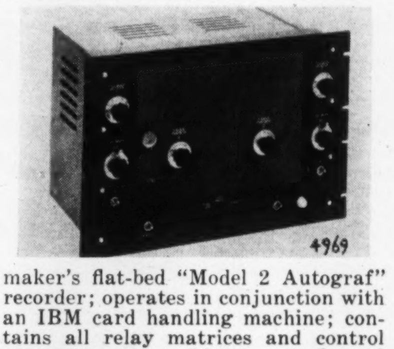
Multi-track Magnetic Rec-Rep Heads

New multi-track magnetic recording and reproducing heads with adequate inter-track shielding and precise gap alignment are designed and manufactured specifically for data recording applications. Each head stack is cast in plastic and mounted in a metal housing for immunity to shock, vibration, and wide ranges of temperature and humidity. Complete interchangeability of models permits use of a single tape transport for varied operations. From 7 to 21 tracks per inch are available depending on crosstalk and track width requirements with gaps to 0.00015 in. Minimal crosstalk obviates need for interlacing tracks in most cases. Maximal width 2 in.—*The Davies Labs. Inc., 4705 Queensbury Rd, Riverdale, Md.*

For more information circle **624** on inquiry card.

Card Translator for XY Recorder

New "Model 30A Card Translator" makes possible rapid plotting of computed points on an automatic basis; is designed specifically for use with maker's flat-bed "Model 2 Autograf" recorder; operates in conjunction with an IBM card handling machine; contains all relay matrices and control apparatus necessary to control card reader and recorder for completely automatic operation.—*F. L. Moseley Co., 409 N. Fair Oaks Ave., Pasadena 3, Calif.*



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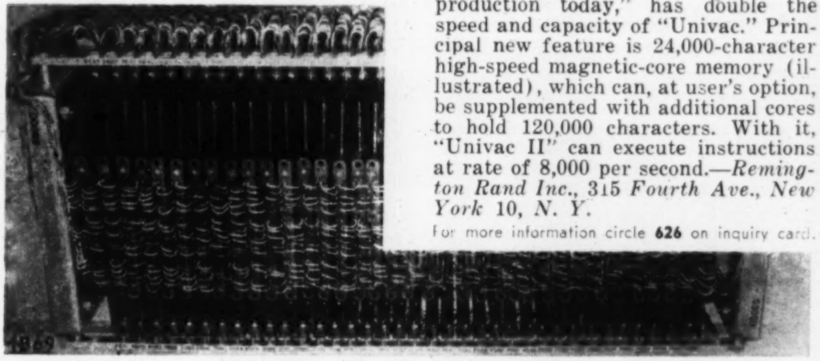
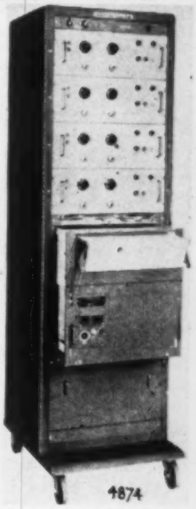
Electronic Computer



New "Univac II," said to be "the most powerful business computer in production today," has double the speed and capacity of "Univac." Principal new feature is 24,000-character high-speed magnetic-core memory (illustrated), which can, at user's option, be supplemented with additional cores to hold 120,000 characters. With it, "Univac II" can execute instructions at rate of 8,000 per second.—*Remington Rand Inc.*, 315 *Fourth Ave., New York* 10, *N. Y.*

For more information circle **626** on inquiry card.

Multichannel Recorders

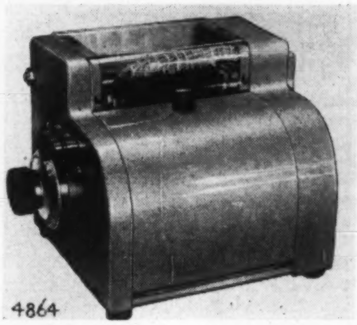


Two new oscillographic recording systems are designed for 6- and 8-channel recording of analog computer output, or other applications involving sensitivity of 1 volt/cm. Features include individual stylus temperature controls, nine paper speeds, regulated power supplies, improved control of input signals by attenuator ratios of 1, 2, 5, etc.—*Sanborn Co.,* 195 *Massachusetts Ave., Cambridge, Mass.*

For more information circle **630** on inquiry card.

210-channel Recorder

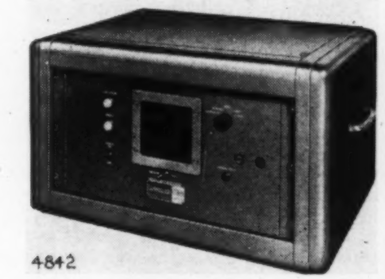
R-1021-1 Miniature Fixed Stylus Recorder" weighs 15 lbs.; provides 210 channels of ON-OFF information on 5-in. wide "Teldeltos" chart; is adaptable to analog, digital, and sequential on-off recording; speed continuously variable from 0.25 to 5 ips.; has same operating characteristics as "R-1021-D Airborne Recorder" but is built for laboratory functions.—*Radiation Inc., Melbourne, Fla.*



For more information circle **627** on inquiry card.

Punched Tape Converter

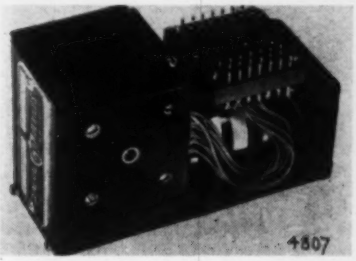
New converter for operating an *X-Y* plotter from digital inputs operates from a punched tape reader; can be operated from a tape-actuated typewriter. For standard converter, tape is punched in five-hole communications code; other codings on special order. Tape reader normally operates at 10 symbols per second; plotter travels full diagonal in 1 sec.; so plotting rate is 1 to 2 sec. per point, depending on point spacing.—*Librascope, Inc.,* 808 *Western Ave., Glendale, Calif.*



For more information circle **629** on inquiry card.

Sampling Switch

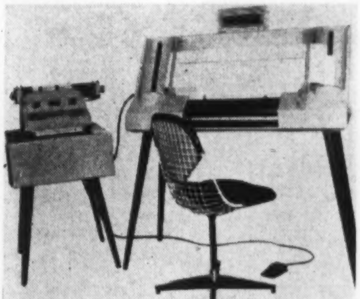
New "Model 1205" high-speed sampling switch for telemetering, data recording, etc., has 2 synchronized poles, 30 contacts per pole, 15 alternate contacts and collector rings per pole tied to individual plugs, self-contained 5-cps. motor.—*General Devices, Inc., Princeton, N. J.*



For more information circle **631** on inquiry card.

Oscillograph-trace Reader

New "Oscar Model N" is based on a new principle: uses a cylinder as linkage between operator and machine; features speed, simplicity and operator convenience. Vacuum tubes have been eliminated from new model. Output is in decimal digits from 000 to 999, in decimal digits from 0000 to 3999; or in straight binary form from 0000 to 4095 counts. Programming is available to automatic typewriter, paper tape punch units or punch card machines.—*Benson-Lehner Corp., Dept. A,* 2340 *Sawtelle Blvd., Los Angeles* 64, *Calif.*

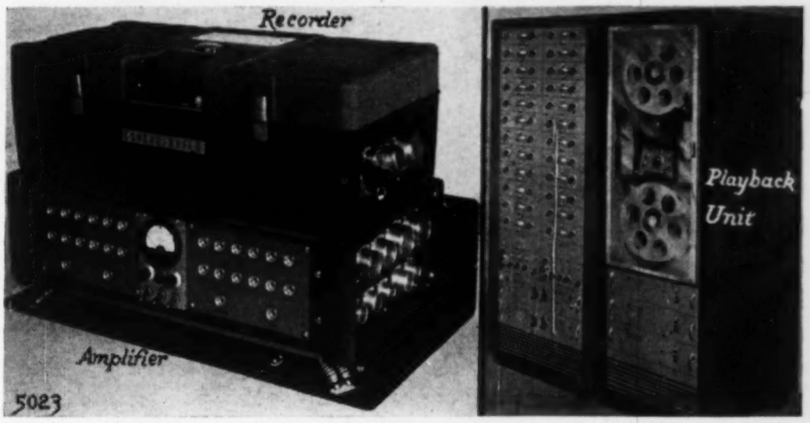


For more information circle **628** on inquiry card.

Automatic Test-data Recording System

New "Datatape" magnetic tape recording system operates unattended aboard airplanes and guided missiles at distances well beyond effective range of telemetering. Recorder unit's capacity 28 tracks on a 1¼-in tape (24 data channels and 4 auxiliary channels including a microphone input) 43 minutes at 10 ips with conventional-thickness tape (70 minutes or longer with thinner tapes and lower speed); operates with less than 1% error using PDM or CM (less than 3% using wide-band FM). Although designed for airborne instrumentation, new system is equally adaptable to other applications. Deliveries late this year.—*Consolidated Engineering Corp., Pasadena* 15, *Calif.*

For more information circle **632** on inquiry card.



AVIATION

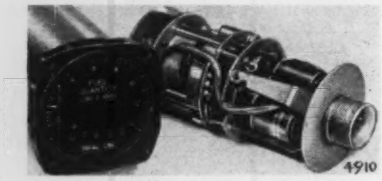
Aircraft Keyer

New "Model T-198A Pulsitometer" meets Air Force requirement for a vibration-resistant keyer in aircraft which utilize a single warning light to indicate two different conditions of overheat, or two pickup points. Keyer enables pilot to differentiate between sources; can also be used to indicate any other dangerous condition.—*Electronic Specialty Co.*, 3456 *Glendale Blvd., Los Angeles* 39, *Calif.*

For more information circle **633** on inquiry card.

Dual-display Fuel Gage

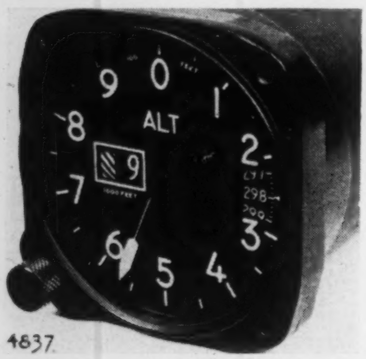
New fuel quantity indicator provides both totalized and individual tank gaging, is for use with maker's fuel management system in multi-tank aircraft; indicates total fuel on a 5-digit counter and individual tank quantities by pointer. Reading of quantity in any tank is obtained by selector switch. Unit meets military specs; can be supplied for clamp- or bezel-mounting.—*Avien*, 58-15 *Northern Blvd., Woodside* 77, *N. Y.*



For more information circle **634** on inquiry card.

Digital Altimeter

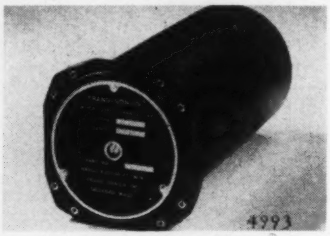
New "Counter Altimeter" displays altitude on a cyclometer register, as mileage is shown by an automobile odometer. Two-digit counter registers thousands of feet; pointer makes one rotation per thousand feet on a dial with 50-ft. graduations. Photo reads 9,565 ft.: "9" digit on counter and 565 ft. indicated by pointer. Altitudes above 10,000 ft. are indicated by two digits.—*Kollsman Instrument Corp., Elmhurst, N. Y.*



For more information circle **635** on inquiry card.

Vertical-speed Pickups

New "Vertical Speed Transducer" provides an ac output voltage linearly proportional to rate of ascent and descent of an aircraft; features unusually high speed of response and can therefore be used (1) to detect when an aircraft has BEGUN to ascend or descend, (2) for stabilizing altitude servos and (3) for manual level flight control. Characteristic time (63%) is 2 sec at 50,000 ft and 0.2 sec at sea-level.—*Trans-Sonics, Inc., Bedford Airport, Bedford, Mass.*



For more information circle **636** on inquiry card.

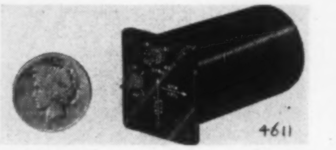
Airborne TV

New closed-circuit TV system designed for use in aircraft includes up to seven cameras and a monitor station. Camera weighs 6½ lbs. Case dimensions (3 x 4¾ x 7½ in.) include automatic illumination control, 3-stage video preamplifier, and non-operational controls in addition to basic TV camera components; simple layout and hinged construction provide better accessibility for servicing than in standard full-size equipment. Monitor equipment is packaged in four standard aircraft electronic cases. System withstands humidity, altitude, vibration, shock, and extreme temperatures. Automatic illumination control's 1000-to-1 range renders direct exposure to sun's rays harmless to camera tube.—*The Davies Laboratories, Inc.*, 4705 *Queensbury Road, Riverdale, Md.*

For more information circle **637** on inquiry card.

Rate Gyro

New Hermetically-Sealed Damped Rate Gyro, said to have high performance characteristics for applications in control systems, autopilots, guided missiles, etc., weighs 0.8 lb. and develops an angular momentum of 400,000 gr.cm.²/sec.; can be damped from 0.2 critical to overdamped through a temperature range of −55°C to 80°C without a heater.—*R. C. Allen Business Machines, Inc.*, 678 *Front Ave., N. W., Grand Rapids, Mich.*

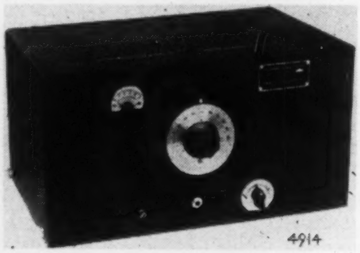


For more information circle **638** on inquiry card.

MISCELLANEOUS

Security Alarm System

New "Model BL-300" protects both indoor and outdoor areas, is a capacitance-type system comprising a control box and two antenna legs. Visible or audible alarm is actuated not only for an intruder but in event of short circuit, tube failure, etc. Sensitivity is adjustable for either major or minor disturbances. Each system protects a linear distance of 500 feet, and several units can be used together to cover any desired distance.—*Browning Laboratories, Inc.*, 750 *Main Street, Winchester, Mass.*



For more information circle **639** on inquiry card.

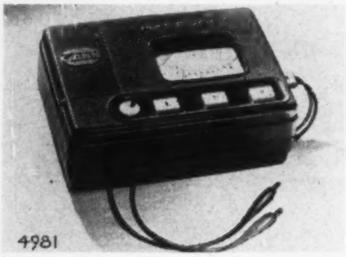
Duplicating Process

New method permits xerography to be used (for the first time) in preparation of spirit and fluid-type duplicating masters; obviates need of typing, drawing, or tracing onto a master; requires about 3 minutes.—*The Haloid Co.*, 2-20 *Haloid St., Rochester* 3, *N. Y.*

For more information circle **640** on inquiry card.

Moisture Meters

New "Gann Hydromats" (German-made) measure moisture content of wood, veneers, concrete, plaster, paper and grain. Model shown is for wood and veneer; scaled 5 to 30 percent; portable and self-contained with batteries and carrying case. Various leads supplied.—*Physics Research Laboratories, Inc.*, 507 *Hempstead Turnpike, West Hempstead, N. Y.*



For more information circle **641** on inquiry card.

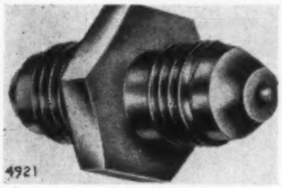
Low-meniscus Mercury

New refinement techniques yield mercury said to present "a beautiful mirror-like surface brilliance with no observable oxidation apparent . . . almost completely free of any meniscus . . . reduction of oxidation to a point where it is not detectable . . . approximately the same price as previously." —*Metalsalts Corp.*, 200 *Wagaraw Road, Hawthorne, N. J.*

For more information circle **642** on inquiry card.

Porous S-S Snubbers

New pressure snubber has for damping element a disc of Type 316 porous stainless steel, assembled into an AN815-4 fitting. Each element is adjusted for use with hydraulic oils, aircraft fuels, air, gases, etc. Exposure of a large porous surface minimizes clogging, whence longer service between cleanings.—*Chemiquip Co.*, 460 *West Broadway, New York* 12, *N. Y.*



For more information circle **643** on inquiry card.

Miniature Storage Cell

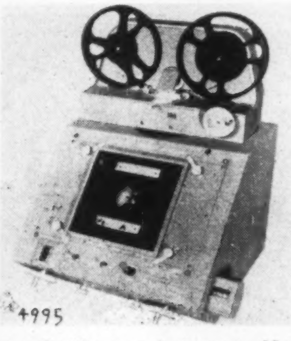
5096
Actual Size
Yardney
SILVERCEL
MODEL HR 01

New commercially-available model of maker's "Silvercel" retains extraordinary power/weight and other performance characteristics of preceding models for secret Defense applications. It is a 0.1 ampere-hour cell designed for telemetering, voltage reference and other instrumentation applications. It provides maximum continuous drain of 500 ma. and peak discharge in excess of 2 amps; features extremely flat voltage output. *Yardney Electric Corp.*, 40 *Leonard St., New York* 13, *N. Y.*

For more information circle **644** on inquiry card.

Motion Analyzer

New "Model 16," utilizes a projector to measure linear motion versus time interval for events recorded on film, thus determining velocities, accelerations, deflections and stresses. Neither special skill nor a darkroom is required. Projection head can be rotated 360 deg. to align angular motions on film with either of two cross-hairs.—*Vanguard Instrument Corp.*, 184 *Casper St., Valley Stream, N. Y.*



For more information circle **645** on inquiry card.

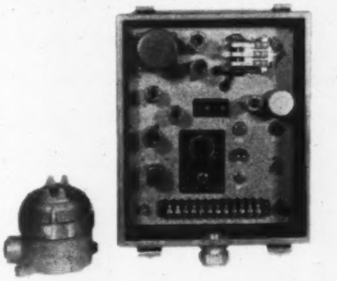
Balloon-borne Cloud Layer Transmitter

New "Cloudsonde" transmits from a weather balloon the altitude levels of clouds in atmosphere; can also detect presence of impurities in atmosphere hardly visible to naked eye, such as smoke, dust or other particles; is handled much like "Radiosonde" (for temperature, pressure and humidity) and is easily added to installations where such facilities already exist; can be further modified to transmit also quantitative data on varying densities.—*Electronics Div., Lucian Labs.*, 220 *Darby Rd., Havertown, Pa.*

For more information circle **646** on inquiry card.

Vibration Monitor

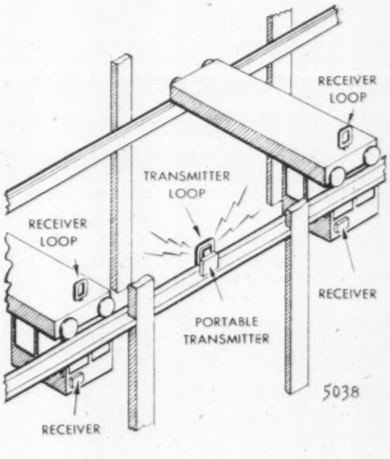
New "Model 4 Vibraswitch" protects rotating equipment in event of excessive vibration; can be wired to actuate a warning or shut down machine. A time delay, selected for application, is incorporated to prevent accidental actuation. In standard unit, scale is calibrated in mils (peak-to-peak); thus "Model 4" is a vibrometer as well as a protective device.—*The Beta Corp., P. O. Box* 8625, *Richmond* 26, *Va.*



For more information circle **647** on inquiry card.

Crane Runway Safety System

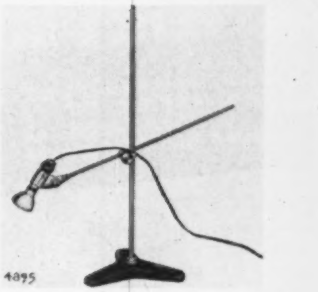
New control system for crane runways permits workers to attend to a disabled crane without danger from approaching cranes; automatically warns of approach or shuts off movement of an oncoming crane. Distance for warning or shut-off action is adjustable from 1 to 20 ft. All equipment is of "fail-safe" design.—*Femco, Inc., Irwin, Penna.*



For more information circle **648** on inquiry card.

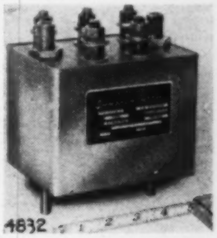
Universal Illuminator

New Universal Illuminator has all-angle adjustment; adjusts to any combination of height and angle; operates on line voltage; needs no transformer, special wiring or connecting plugs.—*Webster Instrument, Inc.*, 11856 *Mississippi Ave., Los Angeles* 25, *Calif.*



For more information circle **649** on inquiry card.

35-kw. Liquid-cooled Germanium Rectifier

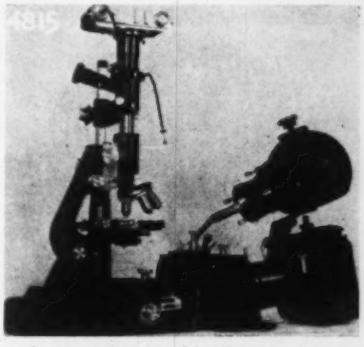


New "Type 53-0075" power rectifier is a 3-phase bridge unit rated for maximum of 450 amps. d-c. continous output; can be supplied for 26, 36, 52 and 66 v.rms. max. input voltages. Volume is approx. 220 cu. in., as against 1650 for fan-cooled comparable selenium unit and 14,000 for copper oxide. New unit requires 0.5 gpm. of liquid coolant (water, oil, etc.) at maximum inlet temperature of 25°C. Efficiency up to 97%; power factor essentially 100%; aging negligible or zero. Rectifier regulation of 2% is possible from no-load to full-load.—*International Rectifier Corp., El Segundo, Calif.*

For more information circle **650** on inquiry card.

Fluorescence Equipment

New "Fluorex" equipment for fluorescence microscopy features two interchangeable ultraviolet radiators: (1) maximum-pressure mercury vapor burner for weakly fluorescent materials and high magnifications; (2) high-pressure mercury vapor burner for highly fluorescent materials and medium to low magnifications.—*Wm. J. Hacker & Co., Inc.*, 82 *Beaver St., New York* 5, *N. Y.*



For more information circle **651** on inquiry card.

Lamp Annunciators

New "GR Type" features a wide variety of window sizes from 1x1-in. to 2¼x3½-in.; employs back-lighted method of illuminating "message."

One or more lamp bulbs can be placed behind engraving and message can be lighted in colors with a steady or flashing signal. Applicable to all forms of alarm services, with relays housed in lamp cabinet or in a remotely-located cabinet. Open, anti-dust or hermetically-sealed plug-in relays.—*H. R. Kirkland Co., Morristown, N. J.*

For more information circle **652** on inquiry card.

Hygrograph

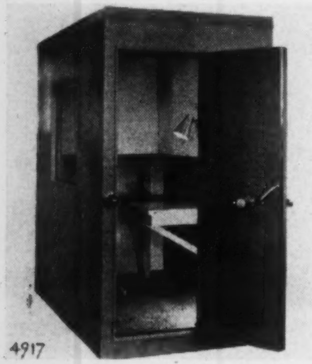
New model of maker's recording hygrometer has a seven-day 12-inch chart with 4-inch scale graduated 0 to

100% relative humidity; can be hung on wall or placed on flat surface. Perforated back and sides permit air circulation past rapidly-responsive hygroscopic filament.—*The Draper Mfg. Co.*, 45 *Warren St., New York* 7, *N. Y.*

For more information circle **653** on inquiry card.

Hearing-test Room

New "Acousti-Room" for audiometric testing, with built-in high-capacity sound absorption and forced mechanical ventilation, is shipped



knocked-down; can house patient, observer and technician in comfort.—*Burgess-Manning Co.*, 5970 *Northwest Highway, Chicago, Ill.*

For more information circle **654** on inquiry card.

"Dry" High-vacuum Pump

New "Evapor-Ion," said to be "the first major new development in high-vacuum pumping technology since the development of the self-purifying oil diffusion pump in 1936," is a completely dry high-vacuum pump, combining a titanium evaporation process and ion pumping to produce low pressures (less than 10^{-8}mm. Hg) without using refrigerated traps or baffles. —*Consolidated Vacuum Corp.*, 735 *Ridge Road, W., Rochester* 3, *N. Y.*

For more information circle **655** on inquiry card.

Fluorescent Kit

New 68-piece fluorescent "Blak-Ray" kit includes chalks, crayons, tempera colors, colored yarns, assorted cardboards, invisible ink, mechanical pencil with invisible lead, and grease pencils. These visual aids, which markedly increase attention and retention can also be purchased individually. Materials are activated by u-v. from "Blak-Ray" lamps also available from maker.—*Ultra-Violet Products, Inc.*, 5114 *Walnut Grove Ave., San Gabriel, Calif.*

For more information circle **656** on inquiry card.

Nylon Balls

New nylon balls for use in valves, bearings, detents, etc., are available in sizes from ⅛ in. to ¾ in. with tolerances to 0.001 in.; provide light weight and chemical resistance. Properties: flow temperature > 480; coefficient of linear thermal expansion 5.5 $\times 10^{-5}$; low thermal conductivity of 1.7; short-time dielectric strength 385; 60-cycle dielectric constant 4.1; low water absorption 1.5; flammability: self-extinguishing.—*Ace Plastic Co.*, 91-30 *Van Wyck Blvd., Jamaica* 35, *N. Y.*

For more information circle **657** on inquiry card.

Automatic Controller for Gas-fired Home Incinerators

New "Incinitrol," automatic-control device for home incinerators, combines safety pilot, gas cock and automatic timing mechanism. Safety pilot shuts off gas in case flame is extinguished, has a 3-ft. internal filter. Once incinerator is installed and pilot lighted, users need only select length of time for burning period: appliance will start and shut off automatically. Several models meet varied specifications of different manufacturers.—*Robertshaw-Fulton Controls Co., Greensburg, Penna.*

For more information circle **658** on inquiry card.

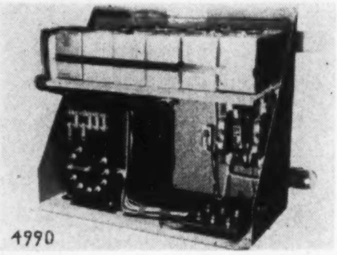
Microwave Absorbers

Two new series of microwave absorbers: (1) "Eccosorb CH" is of flexible rubberized fiber for use in microwave darkrooms; maximum energy reflection 2% at all angles of incidence permits antenna measurements to be made indoors; lightweight and easy to apply. (2) "Eccosorb HF" for use as waveguide terminations and loads is produced in standard rods and sheets or molded to specified shapes. Each member of "HF" series is of a different bulk resistivity; entire range covers from 50 to 10^{12} ohm cm^3.—*Emerson & Cumming, Inc.*, 869 *Washington St., Canton, Mass.*

For more information circle **659** on inquiry card.

2-to-3-phase Converter

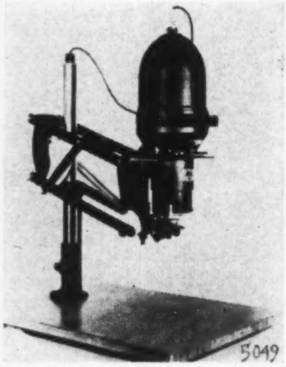
New "Add-A-Phase" converts single-phase current to 3-phase current, obviates cost of providing 3-phase service. Currents can be balanced at any load, and phase angle remains at 120°. Available in 3 models: 150% torque, 200% torque, and special high torque.—*System Analyzer Corp.*, 700 *W. State St., Nokomis, Ill.*



For more information circle **660** on inquiry card

Enlarger

New all-metal "Primos 2¼ x 2¼ Autofocus" features focus adjustment rod which allows automatic focusing with any type of enlarging easel; double condenser and adjustable 150 watt opal bulb for perfect light distribution; coated Schneider Componars 75-mm f/4.5 and 50-mm f/4.5.—*Karl Heitz, Inc.*, 480 *Lexington Ave., New York* 17, *N. Y.*



For more information circle **661** on inquiry card.

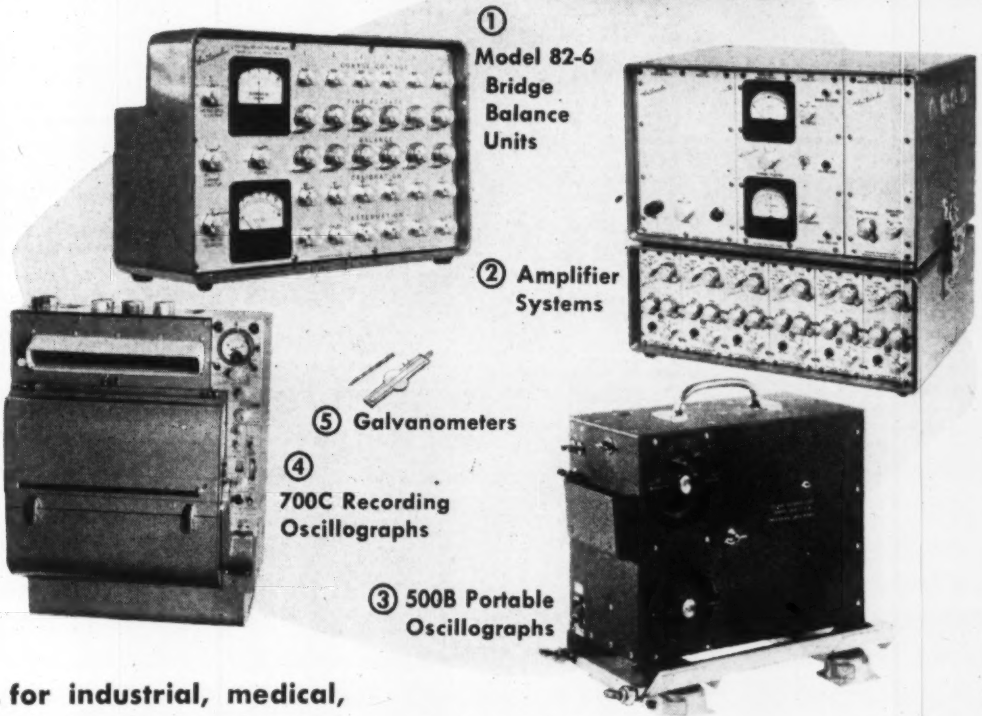
Chart Layout Board

New "Chart Layout Board" featuring an integral "T-Sine Square" unit is for producing chart-gages for contour projectors and comparators. Magnification scales fitted in locating edges permit drawing directly to scale.—*Optical Gaging Products, Inc.*, 26 *Forbes St., Rochester, N. Y.*

For more information circle **662** on inquiry card.

MINNEAPOLIS
Honeywell
Heiland INSTRUMENTS

. . . LEADERS in dynamic recording systems . . .


① Model 82-6 Bridge Balance Units
② Amplifier Systems
⑤ Galvanometers
④ 700C Recording Oscillographs
③ 500B Portable Oscillographs

. . . for industrial, medical, nuclear, military, and aeronautical research

❶ **The Heiland Model 82-6** six channel bridge balance and strain indicator unit provides a simple and accurate means of calibrating, measuring and controlling static and dynamic current phenomena from resistive type transducers in connection with oscillographic recording.

❷ **The amplification** of static and dynamic current phenomena for oscillographic recording is simple and accurate when the highly-stable Heiland Model 119 Carrier Amplifier System is used in conjunction with the Heiland recording oscillograph. For resistive, variable reluctance, and differential transformer type transducers. Provides high amplitude oscillograph recordings having a flat respouse to 1000 cps.

❸ **The 500-B is convenient** for mobile applications where portability and ease of operation are essential. For recording up to 12 separate phenomena. Small in size and easy to operate, the takeup magazine construction of the 500-B permits the taking of short individual records as well as one continuous record 100 ft. long.

❹ **The Heiland 700-series Oscillographs** afford complete accessibility from one operating surface and require only a minimum of space for either table or rack mounting without modification. Features include paper speeds from 0.030 to 144"/sec., daylight loading with separate light-tight takeup and supply drums, and trace velocity to 30,000 inches per second on No. 809 recording paper.

❺ **The Series "M" Sub-miniature Galvanometer** is the most advanced design and is a natural complement to the new 700-series oscillograph. Maximum zero stability, great sensitivity, and ease of adjustment are among its outstanding features.

The solid frame galvanometer for the portable oscillographs incorporates a rugged, dust-free construction. In general, all Heiland galvanometers having a natural frequency of over 500 cycles per second are fluid damped. The optical quality of these fluid-damped types is equal to that of electro-magnetically damped types.

Heiland H HONEYWELL

A DIVISION OF MINNEAPOLIS-HONEYWELL
130 E. 5th Ave., Denver 3, Colo.

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Federal Telephone
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Benson-Lehner Corp.
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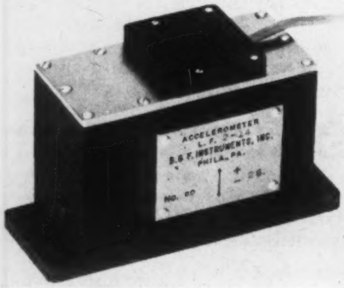
LINEAR ACCELEROMETERS

Designed specifically for OSCILLOGRAPHIC recording of LOW FREQUENCY ACCELERATIONS



Natural Frequency of 7 to 20 cps

±2G to ±15G Models
High Sensitivity for Low Frequencies
Low Sensitivity for High Frequencies
High Damping

WELL PROVEN IN FLIGHT

B & F INSTRUMENTS, INC.
4732 N. Broad St., Phila. 41, Pa.

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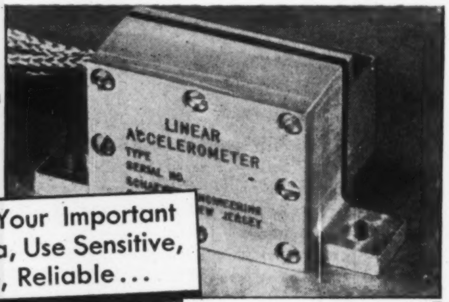


To Get Your Important Test Data, Use Sensitive, Accurate, Reliable...

Schaevitz Accelerometers

Schaevitz Accelerometers are continuously indicating, electro-mechanical, precision units for use in evaluating the performance of vehicles, structural members and accessory equipment. They will enable you to get extremely accurate test results because:

- they're light in weight and have negligible effect upon motion of test body.
- they provide large electrical output suitable for use with other commercially available equipment.
- they're very rugged and are unaffected by mechanical overload several times full scale.
- they employ as pick offs either Linear Variable Differential Transformers or single coil inductors for use in frequency modulated telemetering systems.

Several types of Schaevitz Accelerometers are available to meet your particular requirements: Linear Accelerometers with full scale ranges from ±0.1 to ±700 G and with natural frequencies from 10 cycles per second to 800 cycles per second, and Angular Accelerometers in natural frequencies from 6 to 120 cycles per second for ranges of ±5 to ±100 or more radians/sec^2.

Write, wire or call for complete details.

schaevitz engineering

P.O. Box 505, Camden 1, New Jersey
Merchantville 8-5353

For more information circle 57 on inquiry card.

Hi-Volume AIR SAMPLER

- A basic instrument for *AIR POLLUTION CONTROL*. . . . originally designed in N. Y. office of the A.E.C.
- Designed for indoor and outdoor sampling . . . Time tested . . . *accurately samples particulate matter as small as 1/100th of a micron in diameter.*
- "Inhales" an entire area . . . accomplishes in 10 minutes what previous units took over 36 hours to do.
- Hundreds being used by industry and government . . . for industrial hygiene depts., plant and insurance inspections, determining factory health hazards, atmospheric conditions, smoke abatement, smog, etc.
- Portable . . . Plugs in any 110 volt outlet . . . indispensable for unit or series sampling.

Write for details.

THE Staplex CO.
AIR SAMPLER DIVISION
794 Fifth Ave.
Brooklyn 32, N.Y.

For more information circle **58** on inquiry card.

VIKING

ALARM and SPECIAL INDICATOR SYSTEM

CONTROLS

For your every requirement in controls . . . SPECIFY VIKING. Manufacturers of Safety Controls, Alarm Systems, Special Indicator Systems, Automatic Plant Equipment, Pressure Controls, Temperature Controls, Speed Controls, Electronic Monitoring Systems, Void Detecting Equipment, Porosity Detecting Equipment, Liquid Level Controls. . . .

VIKING INSTRUMENTS INC.
EAST HADDAM, CONN.

For more information circle **59** on inquiry card.

Hathaway Instrument
Heiland Div.
Impact Register
Impactograph Corp.
Lab-Tronics
Land-Air Inc.
Leeds & Northrup
Librascope
Matisa Equipment
Maxson Corp.
Norden-Ketay Corp.
Pacific Scientific
Reeves Instrument
Servo Corp. of America
Techno Inst.
Testa Mfg. Co.
Topp Industries Inc.
Ultradyne Eng'ng Labs Inc.
U. S. Gauge

AIRCRAFT INSTRUMENT TOOLS

Aircraft Electronics
Airdraulics Engineering
American Instrument
Burndy Eng. Co.
Cal-Tronics Corp.
Dixon, Wm., Inc.
Eclipse-Pioneer
Engis Equipment Co.
Farrand Optical Co., Inc.
Gadgets, Inc.
G E Instrument Dept.
Ideal Lab. Tool
Industrial Engg. Corp.
Instr. Associates
Jo-Line Tools
Kollsmann Instrument
Lewis Engineering
Marshall Co.
Nilsson Gage Co.
North Amer. Inst. Co.
Progressive Service Co.
Radio Frequency Labs.
Schwein Engg. Co.
Sheffield Corp.
Sperry Gyroscope Co.
Standard Products

AIRCRAFT NAVIGATIONAL INSTRUMENTS

Aero Electronics
Aeromarine Inst. Co.
Air Associates
Airborne Instruments Lab.
Aircraft Radio
Alden Electronic
American Electroneering
Arma Corp.
Autoflight Inst. Div.
Avion Div.
Bausch & Lomb Opt.
Bendix Aviation Corp.
Boes Co. W. W.
Borg Corp.
Burton Mfg. Co.
Collins Radio Co.
Cook Electric
Datran Engg.
De Jur-Amsco
Doelcam Div.
Eclipse-Pioneer Div.
Electronic Associates
Elgin National Watch
Farrand Optical
Fecker, Inc.
Federal Telephone
Fischer & Porter
Ford Inst. Co.
Gadgets, Inc.
G E Instrument Dept.
General Precision
Gerber Scientific
Giannini & Co.
Globe Industries, Inc.
Gurley, W. & L. E.
Hanson-Gorrill-Brian, Inc.
Harvey-Well Electronics
Hastings Inst. Co.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Humphrey Inc.
Hycon Mfg. Co.
Impact Register
Instr. Associates
Jaeger Watch Co.
Jardur Import
Jarvis Electronics
Kearfott Co.
Kenyon Instrument
Kollsman Instrument
Lear, Inc.
Librascopes, Inc.
Lindly & Co.
Link Aviation Devices
Machlett & Son
Marion Elec. Instr.
Marine Compass Co.
Martin-Hubbard Corp.
Maxson Corp.
Moisture Register Co.
National Co.
Norden-Ketay Corp.
Pacific Scientific
Radio Receptor Co.
RCA Div.
Reeves Instrument
Rieker Inst. Co.
Roller-Smith Co.
Schwien Engg. Co.
Servo Corp. of America
Servomechanisms, Inc.
Servonic Inst. Inc.
Simmonds Accessories
Sperry Gyroscope Co.
Square D Co.
Standard Products
Summers Gyroscope Co.
Ten Bosch Inc., M.
Thwing-Albert Inst. Co.
Triplett Elec. Inst.
Union Switch & Signal
U. S. Gauge Co.
Varo Mfg. Co.
Vectron, Inc.
Wang Labs.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Carl Zeiss, Inc.

AIRCRAFT POWER PLANT INSTRUMENTS

Aero Instrument Co.
Aeromarine Inst. Co.
Aero Research
Airborne Instruments Lab
Airflow Instrument
Associated Research, Inc.
Aviation Engineering
Avien Inc.
Avion Div.
Avionic Products Engg.
Beck Bros.
Bendix Aviation Corp.
Bogue Electric Mfg. Co.
Boston Auto Gage Co.
Bowser Inc.
Bristol Co.
Brooks Rotometer Co.
Cambridge Inst. Co.
Control Engineering Corp.
Datran Engg.
De Jur-Amsco Corp.
Eclipse-Pioneer Div.
Edison Inc., Thomas A.
Electro Products Labs.
Federal Telegraph Co.
G E Instrument Dept.
Griswold Mfg. Co.
Hays Corp.
Hickok Elec. Inst.
Instr. Associates
Jaeger Watch Co.
Karl-Douglas Assoc.
Kenyon Instrument Co.
Kollsman Inst.
Lewis Engg. Co.
Manning, Maxwell, Moore
Marion Electrical Inst. Co.
Moisture Register Co.
Norden-Ketay Corp.
Penn Ind. Inst. Corp.
Phaostron Co.
Rahm Inst. Inc.
Revere Corp.
Rieker Inst. Co.
Roller-Smith
Sensitive Res. Inst.
Servonic Inst. Inc.
Sperry Gyroscope Co.
Standard Products
Stewart-Warner
Thwing-Albert Inst. Co.
Triplett Elec. Inst.
Topp Industries Inc.
U. S. Gauge
U. S. Taximeter
Varo Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

AIR FLOW METERS (See Flowmeters, Gas)

AIR METERS (See Gas Meters, Positive)

AIRPLANE CONTROLS MOVEMENT RECORDERS

Aero Electronics
Airborne Instruments Lab
Barber-Colman Co.
Bendix Aviation Corp.
Breeze Corporations
Bristol Co.
Century Geophysical
Cook Elec.
Doelcam Div.
Eclipse-Pioneer Div.
Epsco, Inc.
Flight Research Eng.
General Elec. Co.
Hamilton Watch Co.
Hathaway Instrument
Heiland Div.
Impact Register
Kollsman Instrument
Lear Inc.
Magnetic Amplifiers
Marion Electrical Inst. Co.
Norden-Ketay Corp.
North Amer. Inst. Co.
Pacific Scientific
Radiation, Inc.
Revere Corp.
Servonic Insts.
Sheffield Corp.
Sound Apparatus
Streeter-Amet Corp.
Summers Gyroscope
Teleflex, Inc.
Thermix Corp.
United Control Corp.
Victory Engr. Co.
Wiancko Engineering

AIRSPEED INDICATOR TESTERS

Amthor Test Inst. Co.
Baldwin-Lima-Hamilton
Bendix Aviation Corp.
Gadgets Inc.
Hathaway Instrument
Ideal Lab. Tool
Instr. Associates
International Radiant
Jaeger Watch Co.
Kollsman Instrument
Meriam Inst. Co.
Trimount Inst. Co.
Wallace & Tiernan

AIRSPEED INDICATORS

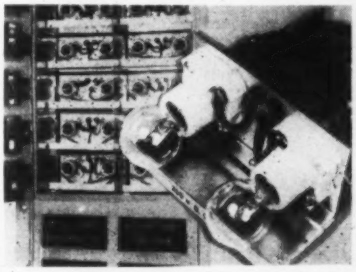
Aeromarine Inst. Co.
Avion Div.
Baldwin-Lima-Hamilton
Bendix Aviation Corp.
Burton Mfg.
Cook Electric
Eclipse-Pioneer Div.
Engler Instrument
Friez Instr. Div.
Gadgets Inc.
General Elec. Co.
General Mills Inc.
Giannini & Co.
Hastings Inst. Co.
Hathaway Instrument
Illinois Testing Labs.
Impact Register
Instr. Associates
Jaeger Watch Co.
Kollsman Inst. Div.
Meriam Co.
Norden-Ketay Corp.
Rahm Inst. Inc.
Raytheon Mfg. Co.
Schwien Engg. Co.
Servomechanisms, Inc.
Taller & Cooper
Ten Bosch Inc., M.
Topp Industries Inc.
U. S. Gauge Co.
Wallace & Tiernan
Waugh Labs.
Westberg Mfg. Co.
Zernickow Co.

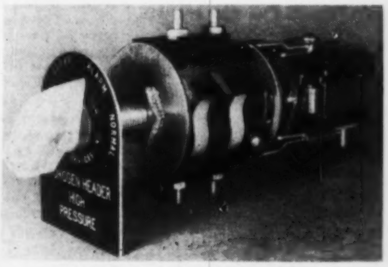
ALARMS, Bearing Temperature

Aero Research
Assembly Products, Inc.
Automatic Temp. Control
Bogue Electric Mfg. Co.
Bristol Co.
Burling Inst. Co.
Clark Cooper Co.
Cole Inst. Co.
Cybertronic Corp.
Edison Inc., Thomas A.
Electric Devices Co.
Electrical Develop.
Electron-Radar Prods.
Fenwal, Inc.
Fielden Instrument Div.
G. E. Instrument Dept.
Illinois Testing Lab.
Industrial Control Panel
Kybernetes Corp.
Leeds & Northrup
Mack Electric Devices
Manning, Maxwell & Moore
Norden-Ketay Corp.
Panellit, Inc.
Phila. Scientific Glass
Powers Regulator
Precision Thermometer

ELECTRO-PANE (BELOW)

A HEAVY-DUTY MERCURY SWITCH WINDOW-TYPE ANNUNCIATOR





ELECTRO-LARM (ABOVE)

A UNIT-TYPE ANNUNCIATOR USED SINGLY OR IN MULTIPLES

ELECTRO-DEVICES, INC.
4025 EASTON AVE.   ST. LOUIS 13, MO.

For more information circle **60** on inquiry card.

NEW PANALARM "50"

. . . simple, plug-in signal system . . .

ALL your signal requirements are fulfilled by a single PANALARM "50". This combined audio-visual system is self-contained, pre-wired, easily installed. New features permit circuit changes without re-wiring. New instrument-type construction gives maximum dependability and service.

All moving parts and contacts are within hermetically sealed, corrosion-proof, plug-in units. Additional signals are merely plugged in.

PANALARM "50" . . . available with backlighted nameplates or bullseye lamps . . . for 3 to 54 signals.

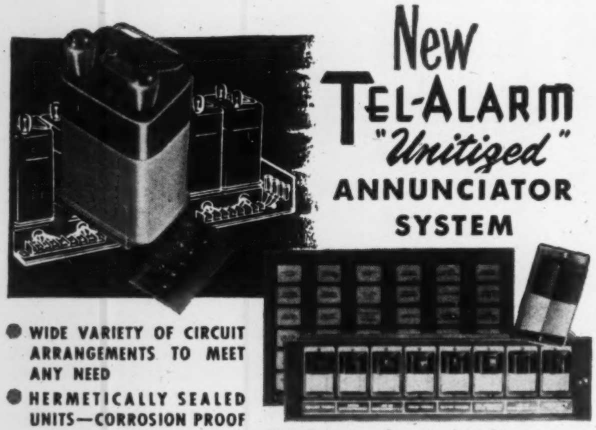
Write for Informative Catalog 100.

PANALARM

PANALARM Div. of PANELLIT, INC.
7406 N. Hamlin Ave., Skokie, Illinois

For more information circle **61** on inquiry card.

New TEL-ALARM *"Unitized"* ANNUNCIATOR SYSTEM



- WIDE VARIETY OF CIRCUIT ARRANGEMENTS TO MEET ANY NEED
- HERMETICALLY SEALED UNITS—CORROSION PROOF
- BACKLIGHTED NAMEPLATES OR TURRET LENSES
- STANDARDIZED FOR EASY USE—LOWER COST

HERE is the first "unitized" annunciator. Tel-Alarm incorporates a basic relay unit with many different circuit arrangements available because of a unique switchboard circuit-header. Tel-Alarm is completely standardized for low cost and easy maintenance.

Tel-Alarm is corrosion proof, hermetically sealed and meets any Class I, Division 2 application. The units are completely self-contained — no complicated wiring—and merely plug into a standard Tel-Alarm chassis. Simple and easy to install.

You can get backlighted nameplates or the new Tel-Alarm *giant* turret lenses for greater visibility. Check into Tel-Alarm today.

Send for your free copy of Bulletin 440

Contains complete circuit sequence diagrams, full range of models for every need.

Tigerman Engineering
COMPANY
4332 North Western Ave., Chicago, Ill.
"Protecting America's Industry"

For more information circle **62** on inquiry card.

Scam Instr. Corp.
Synchro-Start Prods. Inc.
Thermo Electric
Tigerman Engineering
United Electric
Victory Engr.
Viking Instruments

ALARMS, Bin-Level (See Controllers, Automatic, Granular Material

ALARMS, Carbon Bisulphide
Baird Associates
Davis Instruments
Daytronic Corp.
Electron-Radar Prods.
Mine Safety Appliances Co.
Panellit, Inc.
Scam Instr. Corp.

ALARMS, Carbon Monoxide, Combustible Gas, etc.
Bailey Meter
Baird Associates
Bristol Co.
Bristol Engg. Corp.
Bullard Co.
Davis Instruments
Daytronic Corp.
Diatron Co.
Electrical Develop.
Electron Radar Prods.
General Elec. Co.
Johnson-Williams Ltd.
Leeds & Northrup
Mine Safety Appliances
Panellit, Inc.
Scam Instr. Corp.
Taller & Cooper
Thermco Labs
Tigerman Engineering

ALARMS, High, low water (See Alarms, Liquid Level)

ALARMS, Hydrogen Sulphide
Baird Associates
Davis Instruments
Daytronic Corp.
Electrical Develop.
Electron-Radar Prods.
Mine Safety Appliances
Scam Instr. Corp.
Tigerman Engineering
Viking Instruments

ALARMS, Inflammable Gas
Bristol Co.
Bullard Co.
Davis Instruments
Daytronic Corp.
Diatron Co.
Electrical Develop.
Electron-Radar Prods.
Engelhard, Charles
Engineering Labs., Inc.
General Electric
Johnson-Williams, Ltd.
Leeds & Northrup Co.
Mine Safety Appliances
Raytheon Mfg.
Scam Instr. Corp.
Thermco Labs.
Tigerman Engineering
Viking Instruments, Inc.

ALARMS, Liquid Level
Aeromarine Inst. Co.
American Chain & Cable
Anton Electronics Labs.
Atwood & Morrill
Autocall Co.
Automatic Control Co.
Aviation Engineering
Bailey Meter Co.
Baldwin-Lima-Hamilton
Barton Instrument
Bendix Aviation Corp.
Bin-Dicator Co.
Boston Auto Gage Co.
Bristol Co.
Brooks Rotameter
Builders-Providence
B. W. Controller
Campbell Co., J. A.
Cincinnati Div.
Clark Cooper Co.
Continental Foundry
Cook Electric
Cutler-Hammer, Inc.
Daytronics Corp.
Devtronics, Inc.
Eclipse Fuel Engr.
Eclipse-Pioneer Div.
Electrical Develop.
Electro Devices, Inc.
Electron-Radar Prods.
Electronic Prod. Co.
Ellison Draft Gage Co.
Fielden Instrument
Fischer & Porter
Foxboro Co.
Friez Instrument Div.
Gilmore Industries Inc.
Hagan Corp.
Haledy Electronics
Hays Corp.
Industrial Control Panel
Industrial Elec. Controls
Indus. Electronics (Mass.)
Instruments Corp.
Instruments Inc.
International Std. Trading
Jarco Services
Jerguson Gage & Valve
Jo-Bell Products
Johnson Corp.
Jordan Electronics
Kieley & Mueller, Inc.
L. A. B. Corp.
Leupold & Stevens
Liquidepth Indicators
Lumenite Co.
Magnetrol Inc.
Manning, Maxwell & Moore
Marshalltown Mfg. Co.
Mason-Neilan Regulator
McAlear Mfg.
McDonnell & Miller, Inc.
Mercoid Corp.
Metrotype Corp.
Minneapolis-Honeywell
Moore Products
Mosher Electronic
Northern Equip. Co.
Nuclear Research
Ohmart Corp.
Panellit, Inc.
Penn Ind. Inst. Div.
R-C Scientific Inst. Co., Inc.
Reliance Gauge Column
Republic Flow Meters Co.
Rochester Mfg.
Scam Instruments Corp.
Schade Valve Mfg. Co.
Servo-Tek Products Co.
Shallcross Controls
Shand & Jurs Co.
Southwest Control
Square D Co.
Synchro-Start Products
Taylor Instrument Cos.
Techniflex Corp.
Tigerman Engineering
Trimont Inst. Co.
Uehling Instrument
United Electric
U. S. Gauge
Vapor Recovery Systems
Viking Instruments
Warrick Co.
Water Level Controls
Weksler Thermometer
Weston Elec. Inst.
Yarnall-Waring Co.

ALARMS, Radiation
Anton Electronics Labs
Bendix Aviation Corp.
Berkeley Scientific
Daytronic Corp.
Detectolab, Inc.
El-Tronics, Inc.
G E Apparatus Sales
Georator Corp.
Jordan Electronics
Kybernetes Corp.
Menlo Research
Microchemical Specialties
NRD Instrument Co.
Nuclear Inst. & Chem.
Nuclear Measurements
Nuclear Research
Ohmart Corp.
Radiation Counter Labs.
Radiation Inst. Dev. Lab.
R-C Scientific Inst.
Scam Instruments Corp.
Servo Corp. of America
Standard Piezo
Tracerlab, Inc.
United Engineers
Victoreen Inst. Co.
Western Radiation
Yarnall-Waring Co.

ALARMS, SMOKE (See Smoke Density Indicators)

ALIDADES (See Surveying Instruments)

ALKALIMETERS
Ace Glass Inc.
Beckman Instrument
Bellco Glass, Inc.
Central Scientific Co.
Fisher Scientific Co.
General Elec. Co.
Hellige, Inc.
Industrial Inst. Inc.
Kimble Glass Co.
Kontes Glass Co.
Martin & Co.
Rowe Radio Research
Rubicon Co.
Ruehfel Co.
Scientific Glass
Specialty Glass Co.
Taylor & Co., W. A.
Thwing-Albert Inst. Co.
Will Corp.
Weston Elec. Inst.

ALTIMETER TESTERS
American Paulin System
American Research
Amthor Test. Inst. Co.
Baldwin-Lima-Hamilton
Cal-Tronics Corp.
Fuess, Inc.
Hathaway Instrument
Ideal Lab. Tool
International Radiant
Kenyon Instrument Co.
Meriam Inst. Co.
Pioneer Instrument Co.
Standard Products
Tenney Eng'ng.
Trimount Inst. Co.
Wallace & Tiernan

ALTIMETERS (See Barometers, Altitude)

ALTIMETERS, Level Flight
Aeromarine Inst. Co.
American Paulin
Avion Div.
Baldwin-Lima-Hamilton
Burton Mfg.
General Mills Inc.
Giannini & Co.
Impact Register
Instr. Associates
Kollsman Inst.
Norden-Ketay Corp.
Rahm Inst., Inc.
Raytheon Mfg. Co.
U. S. Gauge
Wallace & Tiernan

ALTIMETERS, Surveying
American Paulin
Bruning Co.
Eugene Dietzgen Co.
Galetronics Inc.
Opplem Co., Inc.
RCA Div.
Sperry-Sun Well Surveying
Stratex Instrument Co.
Taylor Instrument
Wallace & Tiernan

ALTIMETER TESTERS
Kollsman Instrument
Meriam Instrument
Norden-Ketay Corp.

ALTITUDE BAROMETERS (See Barometers, Altitude)

AMMETERS, A-c. Multirange
Assembly Products
Associated Research
Ballantine Labs.
Bradshaw Instruments
Bristol Co.
Burlington Instrument
Chicago Industrial
Columbus Products Corp.
De Jur-Amsco Corp.
Dittmore & Freimuth
Electronic Inst. Co., Inc.
Electronic Meas. Co.
Englehard Inc., Charles
Esterline-Angus
G E Apparatus Sales
Greibach Instruments
Hickok Elec. Inst. Co.
Magnetic Industries
Niagara Elec. Inst.
Phaostron Co.
Physics Research Labs.
Precision Apparatus Co.
Radio City Products
Rawson Elec. Inst.
Roller-Smith
Sensitive Res. Inst.
Simpson Electric Co.
Triplett Elec. Inst.
United Optical Mfg.
U. S. Gauge Co.
W. M. Welch Scientific Co.
Westinghouse Elec.
Weston Elec. Inst.

AMMETERS, Clamp Type
Bristol Co.
Columbia Elec.
Dale Instruments
Electronic Development
Ferranti Electric
G E Instrument Dept.
H. D. Electric Co.
Hickok Elec. Inst. Co.
International Std. Trading
Martindale Electric Co.
Pyramid Instrument
Rochester Mfg. Co., Inc.
Schweitzer Mfg. Co.
Sticht Co.
United Optical Mfg.
U. S. Gauge
Weston Elec. Inst.

AMMETERS, Contact-making
Assembly Products
Bristol Co.
Burlington Instruments
Dittmore & Freimuth
Esterline-Angus Co.
Fielden Instrument
GE Instrument Dept.
Hickok Electrical Inst.
Larson Instrument
Lewis Engineering
Marion Electrical Inst. Co.
Phaostron Co.
Rochester Mfg. Co.
Roller-Smith
Simpson Electric Co.
Triplett Elec. Inst.
United Electric Co.
West Corp.
Weston Electrical Inst.

AMMETERS, Indicating
Assembly Products
Associated Research
Barber-Colman Co.
Beede Elec. Inst.
Burlington Inst. Co.
Cambridge Inst. Co.
Columbia Elec. Mfg.
Columbus Products Corp.
Dale Instruments
De Jur-Amsco Corp.
Dittmore & Freimuth
Eclipse-Pioneer Div.
Electric Auto-Lite
Electric Design & Mfg.
Electro-Mech. Inst.
Electronic Meas. Co.
Electro-Tech Equip.
Electronic Development
Engelhard, Chas.
Ferranti Electric, Inc.
Fielden Instrument
Gar Electrical Instrument
G E Instrument Dept.
Hickok Elec. Inst. Co.
International Instruments
J-B-T Insts.
Lewis Engineering
Magnetic Industries
Manning, Maxwell & Moore
Marion Electrical Inst.
Meters, Inc.
Miller, M. C.
Niagara Electrical Inst.
Norton Electrical Inst.
Pace Electrical Inst.
Phaostron Co.
Physics Research Labs.
Precision Apparatus Corp.
Pyramid Inst. Co.

Radio City Products Co.
Rawson Elec. Inst. Co.
Rochester Mfg. Co.
Roller-Smith
Sendur Mfg.
Sensitive Research Inst.
Shurite Meters
Simpson Electric Co.
Sterling Mfg. Co.
Stewart-Warner
Sticht Co., Herman
Sun Manufacturing
Triplett Electrical Inst.
United Electric Co.
United Optical Mfg.
U. S. Gauge
Welch Mfg. Co.
W. M. Welch Scientific Co.
West Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Instruments Div.
Winslow Co.

AMMETERS, Laboratory Standard
Burlington Instrument
Central Scientific
Columbus Products Corp.
G E Instrument Dept.
Greibach Instruments
Hickok Elec. Inst. Co.
Physics Research Labs.
Rawson Elec. Inst.
Roller-Smith Co.
Sensitive Research Inst.
Simpson Electric Co.
Triplett Elec. Inst.
United Optical Mfg.
W. M. Welch Scientific Co.
Weston Elec. Inst.
Will Corp.

AMMETERS, Microammeters
Applied Physics
Assembly Products
Ballantine Labs.
Beckman Instruments
Beede Elec. Instrument
Beta Electric Corp.
Bristol Co.
Burlington Inst. Co.
Burton-Rogers Co.
Cambridge Inst. Co.
Chicago Indus. Inst.
Clough-Brengle Co.
Columbus Products Corp.
Dale Instruments
De Jur-Amsco Co.
Dittmore & Freimuth
Doecalm Div.
Electric Design & Mfg.
Electronic Development
Engelhard, Chas.
Fielden Instruments
Gar Electrical Instrument
G E Instrument Dept.
General Electronic
Hickok Elec. Inst. Co.
Industrial Control Co.
International Instruments
Keithley Instruments
Leeds & Northrup Co.
Lewis Engineering
MacDonald Co. W. S.
Magnetic Industries
Marion Electrical Inst.
Meters, Inc.
Mil Instrument Corp.
Millivac Instruments
Norton Electrical Inst.
Pace Electrical Inst.
Pfaltz & Bauer, Inc.
Phaostron Co.
Physics Research Labs.
Precision Apparatus Co.
Pyramid Inst. Co.
Radio City Products Co.
RCA Tube
Rawson Elec. Inst. Co.
Roller-Smith
Scientific Specialties
Sensitive Research Inst.
Shallcross Mfg. Co.
Shelby Inst. Co.
Simpson Elec. Co.
Sun Electric Corp.
Supreme, Inc.
Technology Inst. Corp.
Thwing-Albert Inst. Co.
Triplett Electrical Inst.
Triumph Mfg. Co.
United Optical Mfg.
Waveforms Inc.
W. M. Welch Scientific Co.
West Instrument Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

AMMETERS, Microammeters, A-c Rectifier
Assembly Products
Ballantine Labs.
Burlington Instrument
Chicago Indust. Inst.
Columbus Products Corp.
Dale Instruments
De Jur-Amsco Corp.
Dittmore & Freimuth
Electric Design & Mfg.
Electronic Development
Fielden Instrument
Gar Electrical Instrument
General Electric
General Electronic
Greibach Instruments
Hickok Elec. Inst. Co.
Magnetic Industries
Marion Elec. Inst.
Meters, Inc.
Mil Instrument Corp.
Pace Electrical Inst.
Phaostron Co.
Physics Research Labs.
Precision Apparatus Co.
Radio City Products Co.
Roller-Smith
Sensitive Research Inst.
Simpson Electric Co.
Supreme, Inc.
Triplett Elec. Instrument
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst.

AMMETERS, Milliammeters
Assembly Products
Ballantine Labs.
Barber-Colman
Beckman Insts.
Beede Elec. Instrument
Bradshaw Instruments
Bristol Co.
Burlington Inst. Co.
Burton-Rogers Co.
Cambridge Inst. Co.
Chicago Indust. Inst.
Clough Brengle Co.
Columbus Products Corp.
Dale Instruments
De Jur-Amsco Corp.
Dittmore & Freimuth
Electric Design & Mfg.
Electro-Mech. Inst.
Electronic Development
Electronic Instrument
Electronic Meas. Co.
Engelhard, Chas.
Esterline-Angus Co.
Fielden Instrument
Gar Electrical Inst.
G. E. Apparatus Sales
General Electronic
Greibach Instruments
Hickok Elec. Inst. Co.
International Instruments
J-B-T Insts.
Leeds & Northrup
Lewis Engineering
Magnetic Industries
Manning, Maxwell & Moore
Marion Electrical Inst.
Meters, Inc.
Mil Instrument Corp.
Miller, M. C.
Norton Electrical Inst.
Pace Electrical Inst.
Phaostron Co.
Physics Research Labs
Precision Apparatus Co.
Radio City Products Co.
Rawson Elec. Inst. Co.
RCA Div.
Reiner Electronics
Roller-Smith
Scientific Specialties
Sensitive Research Inst.
Shallcross Mfg. Co.
Shelby Instrument
Shurite Meters
Simpson Elec. Co.
Standard Science Sup.
Sun Electric Corp.
Supreme, Inc.
Technology Inst. Corp.
Texas Instruments
Thwing-Albert Inst. Co.
Triplett Electrical Inst.
United Electric Co.
United Optical Mfg.
W. M. Welch Scientific Co.
West Instrument Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

AMMETERS, Recording
Autocall Co.
Barber-Colman Co.
Bristol Co.
Cambridge Inst. Co.
Dittmore & Freimuth
Edin Electronic
Engelhard, Chas.
Esterline-Angus Co.
Fielden Instrument
G E Instrument Dept.
HD Electric
Larson Instrument
Leeds & Northrup Co.
Manning, Maxwell & Moore
Massa Labs.
Metrotype Corp.
Minneapolis-Honeywell
Physics Research Labs
Precise Measurements
Roller-Smith
Sanborn Co.
Sound Apparatus
Sticht Co.
Taller & Cooper
Texas Instruments
Wallace & Tiernan
Westinghouse Elec.
Weston Elec. Inst.
Wheelco Instruments Div.

AMMETERS, Split Core
Bristol Co.
Columbia Elec. Mfg.
Columbus Products Corp.
Dale Instruments
Ferranti Electric
G E Instrument Dept.
HD Elec. Co.
Norton Electrical Inst.
Physics Research Labs.
Pyramid Inst. Co.
Roller-Smith Co.
Rubicon Co.
Sticht Co., Herman
Triplett Elec. Inst.
Weston Elec. Inst. Corp.

AMMETERS, Surge-Crest
Bristol Co.
Columbus Products Corp.
General Elec. Co.
Sensitive Research Inst.

AMMETERS, Thermionic
Ballantine Labs.
Columbus Products Corp.
Dale Instruments
G E Apparatus Sales
General Radio Co.
Lewis Engineering
Meters, Inc.
Physics Research Labs.
Sensitive Research Inst.
Simpson Electric Co.
Westinghouse Elec.

AMMETERS, Thermo
American Elec. Chicago
Assembly Products
Burlington Inst. Co.
Cambridge Inst. Co.
Columbus Products Corp.
Dale Instruments
De Jur-Amsco
Electronic Development
General Elec. Co.
Greibach Instruments
Hickok Elec. Inst. Co.
Lewis Engineering
Marion Electrical Inst.
Meters, Inc.
Physics Research Labs.
Rawson Elec. Inst. Co.
Roller-Smith
Sendur Mfg.
Sensitive Research Inst.
Shelby Instrument
Simpson Electric Co.
Sun Manufacturing
Triplett Electrical Inst.
Welch Scientific
West Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.

AMMETERS, Thermo-Milliammeters
Assembly Products
Bristol Co.
Burlington Instrument
Columbus Products Corp.
Dale Instruments
Dittmore & Freimuth
Electronic Development
General Electric
Greibach Instruments
Hickok Elec. Inst. Co.
Lewis Engineering
Magnetic Industries
Meters, Inc.
Physics Research Labs.
Rawson Elec. Inst.
Roller-Smith
Sensitive Research Inst.
Simpson Electric Co.
Triplett Elec. Instrument
Welch Scientific
West Instrument Corp.
Westinghouse Elec.
Weston Elec. Instrument

AMMETERS, Zero-Resistance
Bristol Co.
Hickok Elec. Inst. Co.
Marion Elec. Instrument
Miller, M. C.
Phaostron Co.
Physics Research Labs.
Rockwell Engr.
Sensitive Research Inst.
United Optical Mfg.

AMMONIA ANALYZERS (See Gas Analyzers, Ammonia)

AMMONIA CONTROL EQUIPMENT
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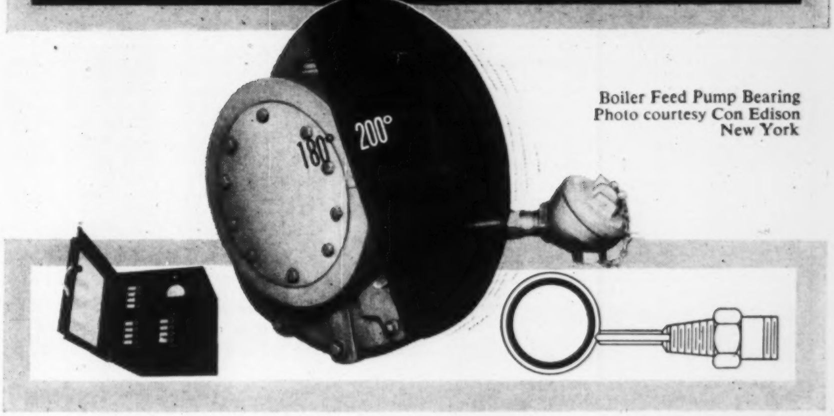
Askania Regulator Co.
Autoclave Engrs.
Bailey Meter Co.
Bastian-Blessing Co.
Builders-Providence, Inc.
Cash Co., H. W.
Cash Value Mfg.
Dahl & Co., G. W.
Everson Mfg. Co.
Fischer & Porter
Foster Engineering
Frick Co.
General Controls
Hammel-Dahl Co.
Hoke, Inc.
Jo-Bell Products
Jordan Regulator Corp.
Lear Inc.
Lumenite Co.
Magnetrol, Inc.
Marsh Corp., Jas. P.
McAlear Mfg. Co.
Mercoid Corp.
Milton Roy Co.
Natural Gas Equip.
Philadelphia Thermo Co.
Phillips Petroleum
Proportioneers, Inc.
Research Controls
Schutte & Koerting
Shallcross Controls
Taylor Inst. Cos.
Taylor & Co., W. A.
Thermco Labs.
Wallace & Tiernan Prods.
Waukee Engineering
Weston Elec. Inst.

AMPEREHOUR METERS
Associated Research
G E Apparatus Sales
Hetherington & Berner
Landis & Gyr, Inc.
Sangamo Electric Co.
Westinghouse Elec.

AMPLIFIERS, A-C.
ACF Electronics Div.
Aero Electronics
Aerovox Corp.



How Omniguard overheat protection can double motor bearing life

Boiler Feed Pump Bearing
Photo courtesy Con Edison
New York

Any way you look at it, Omniguard becomes a necessity for today's high-speed automatic plant equipment. Omniguard signals *instantly* when an overheat condition is near—*before* valuable equipment or processes are harmed.

Recent studies* prove, for example, that a mere 20° increase above 180°F. cuts in *half* the bearing life of rotating equipment. And this is just one instance of the devastating effects of overheat that EDISON Omniguard prevents.

Modular construction permits control of as few as four points or as many as are needed. Installation costs are 50 per cent less than any previous system — and maintenance is virtually nil.

You'll find it well worth your while to investigate Omniguard — a remarkable development from the world-famous EDISON *Laboratory.*

*Published by *Electrical Manufacturing.*

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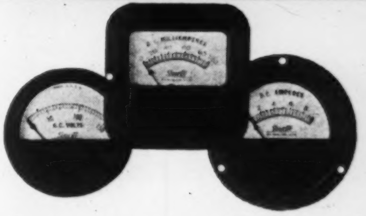

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USES—plate current and voltage readings; battery charging, emergency lighting, fire or burglar alarm units; TV antenna rotator indicators; voltage regulators, transmitters, receivers, plating equipment, AC line testers, field indicators, etc.

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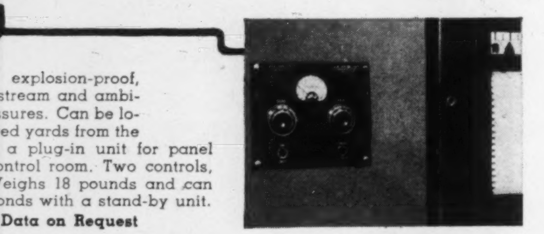
PLANT-STREAM ANALYZER

for the automatic control of continuous-flow processes involving most heteroatomic gases.

LISTON-BECKER MODEL 21 PLANT-STREAM ANALYZER



Pickup is weather-tight, explosion-proof, immunized to changes in stream and ambient temperatures and pressures. Can be located up to several hundred yards from the **Electronic Section**, a plug-in unit for panel mounting in the control room. Two controls, only four tubes. Weighs 18 pounds and can be replaced in seconds with a stand-by unit.

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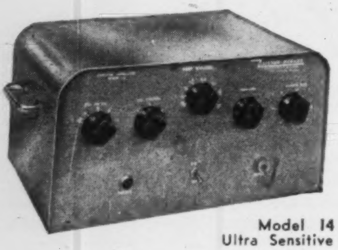

Model 14
Ultra Sensitive

Ultrasensitive Breaker-Type

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With the lowest noise level and highest zero stability of any D-C Amplifier available commercially, it forms a vital link in many of the highest-precision instrumentation systems for research and process control.

Noise Level: close to theoretical limit.
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Jersey City Tech. Lab.
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Kaye Development
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Metron Instrument
Metrotype Corp.
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Minneapolis-Honeywell
Minnesota Electronics
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New London Instrument
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Olympic Dev. Co.
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Photron Instrument
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Spencer-Kennedy
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Varo Mfg. Co.
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Walkirt Co.
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American Helicopter Div.
Arrow Electronics
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Avion Div.
Berkshire Labs.
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Nelson Instrument
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Westronics, Inc.

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Kaye Development
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Krohn-Hite Inst. Co.
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Rowe Engineering
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Sherron Metallic
Southwestern Ind. Elec.
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Vectron, Inc.
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Douglas Radio Labs.
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Edin Co., Inc.
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Electro-Medical Lab.
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Electronic Res. Assocs.
Electronic Tube
Ellis Associates
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Erwood Inc.
Farrand Optical
Federal Telephone
Feiler Engineering
Femco, Inc.
Fielden Instrument
Ford Inst. Co.
Furst Electronics
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General Radio Co.
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Goodyear Aircraft
Hagan Corp.
Hathaway Instrument
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International Std. Trad.
Islip Radio Mfg.
James Vibrapower Co.
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Jersey City Tech Lab.
Kahn & Co.
Kay-Lab.
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Metrotype Corp.
Midwestern Instruments
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Millivac Instruments
Minneapolis-Honeywell
Minnesota Electronics
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Offner Electronics
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Perkin Elmer Corp.
Philbrick Researches
Phoenix Precision Inst.
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Phototron Inst. Corp.
Photovolt Corp.
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Photron Instruments
Precision Radiation Instr.
Southwestern Ind. Elec.
Technical Insts., Inc.
Telectro Industries
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Aero Electronics
Allegany Instrument
Allied Engrg. Div.
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Antenna Research Lab.
A.R.F. Products
Atomic Instrument
Atomlab, Inc.
Automatic Temp. Control
Avion Div.
Berkeley Scientific
Beva Laboratory
Brush Electronics Co.
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Hagan Corp.
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Heiland Div.
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Kaye Development
Krohn-Hite Inst. Co.
Langevin Mfg. Corp.
Leeds & Northrup
Linear Equipment
Link Aviation Inc.
L & O Res. & Dev. Corp.
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Midwestern Instruments
Miller Corp.
Millivac Instrument
Neucor, Inc.
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Specialties Inc.
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Technical Measurements
Thordarson-Meissner
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Tracerlab
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Communication Accessories
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Feedback Controls
Ford Instrument
GE Apparatus Sales
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Kearfott (Western)
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Magnetic Industries
Magnetic Instrument
Magnetic Research
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Norden-Ketay Corp.
Perkin Engineering Co.
Polytechnic Res. & Dev.
Potter Instrument
Raytheon Mfg.
Sangamo Electric
Specialties Inc.
Standard Electronic
Sterling Transformer
Thermador Electrical
Thordarson-Meissner
Timely Instruments
Topp Industries
Torwico Electronics
Varo Mfg. Co.
Vari-L. Co.
Vickers Elec. Div.
Westinghouse Electric

AMPLIFIERS, Radio Frequency

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Airborne Instruments Lab.
Allied Engrg. Div.
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American Electroneering
American Electronic Labs.
American Mach. & Foundry
Antenna Research Lab.
Audio Development
Bendix Aviation Corp.
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Bunnell Co., Inc., J. H.
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Canoga Corp.
C.G.S. Labs.
Clarke Inst. Corp.
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Columbus Products Corp.
Computer Co. of America
Concord Radio Corp.
Devtronics Inc.
Diatron Co.
Dittmore & Freimuth
D & R Limited
Electrical & Phys. Inst.
Electro-Mech. Research
Electronic & Engrg. Serv.
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Erdco Engrg. Corp.
Feiler Engineering
Ferris Inst. Corp.
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Georator Corp.
Harvey Radio Labs.
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Hydro-Aire Inc.
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International Telemeter
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Kay-Lab
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Lear Inc.
Linear Equipment Labs.
L & O Res. & Dev. Corp.
Mag Elec. Prod.
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Metrotype Corp.
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New London Instrument
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Varian Associates
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Virginia Electronics
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Waveforms Inc.
Weinschel Engrg. Co.
West Coast Electronics
Wilmar Mfg.

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Century Geophysical
Commercial Research
Consolidated Engrg.
Daytronic Corp.
Diatron Co.
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Electro-Products Labs.
Endevco Corp.
Engrg. Research & Dev.
Erwood, Inc.
Feiler Engineering
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Mag Elec. Prod.
Magnetic Instrument
Midwestern Instruments
Miller Corp.
Phototron Inst. Corp.
Pickard & Burns
Raytheon Mfg. Co.
Scott Inc., H. H.
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Sperry Gyroscope Co.
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AMPLIFIERS, Wideband

ACF Electronics Div.
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American Mach. & Foundry
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Avion Div.
Bendix Aviation Corp.
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Caltronics Corp.
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Coulter Electronics
Deltron, Inc.
Diatron Co.
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Electro-Mech Research
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Electronic Res. Assoc.
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Electro-Voice Inc.
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Engr. Research & Dev.
Epsco Inc.
Federal Telephone
Feiler Engineering
F. R. Machine Works
Furst Electronics
General Radio Co.
Hathaway Inst. Co.
Hewlett-Packard
Huggins Laboratories
Industrial Test. Equip.
International Telemeter
Kahn & Co.
Kay-Lab
Kaye Development
Kearfott (Western)
Mag. Elec. Products
Magnetic Instrument
Marconi Inst. Ltd.
Millivac Inst. Co.
Nailey Co.
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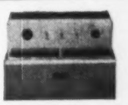

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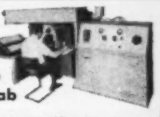

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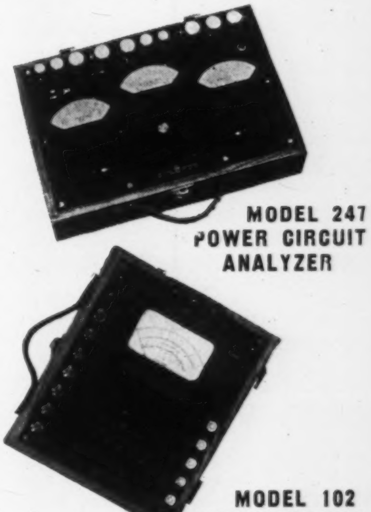

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Amplifier Co.
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Audio Instrument
Authorized Mfrs. Serv.
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Ballantine Labs.
Beam Instrument
Bell Sound Systems
Berkeley Scientific
Berndt-Bach Inc.
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Browning Labs.
Brush Electronics
Century Geophysical
Cinema Engr.
Clark Radio Equip.
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Clough Brengle Co.
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Computer Co. of America
Computer Engg. Assoc.
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Electro-Mech. Research
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Electro Products Lab.
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Electronic Dev. Lab.
Electronic Inst. Co., Inc.
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Federal Telephone
Feiler Engineering
Femco, Inc.
Ferranti Electric, Inc.
Freed Transformer
Furst Electronics
General Elec. Co.
General Mills, Inc.
General Radio Co.
Georator Corp.
Globe Phone Mfg. Co.
Hathaway Inst. Co.
Harvey Radio Labs.
Heiland Div.
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Hickok Elec. Inst. Co.
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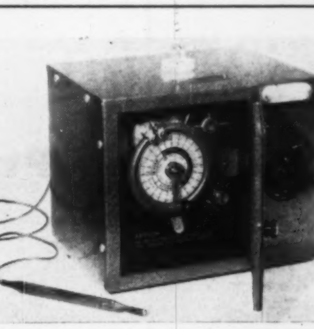

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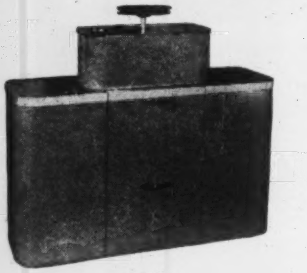

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Millen Mfg. Co.
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National Co.
New London Instrument
Pacific Instrument Co.
Pacific Transducer Corp.
Polarad Electronics
Premier Crystal Labs.
Radio Receptor Co.
Rauland Borg Corp.
Raytheon Mfg. Co.
RCA Div.
Reiner Electronics
Scott, Inc., Hermon
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
Sound Apparatus
Southwestern Ind. Elec.
Standard Transformer
Sunshine Scientific
Sylvania Elec. Prod.
Technology Instrument
Teletronics Laboratory, Inc.
Televiso Co.
Thordarson-Meissner
Triumph Mfg. Co.
United Transformer Corp.
Vectron, Inc.
Virginia Electronics
Waveforms, Inc.
Westinghouse Elec.
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Marconi Insts. Ltd.
Metrotype Corp.
Scott, Inc., H. H.
Shallcross Mfg. Co.
Stoelting Co., C. J.

AUTOCLAVES, High-Pressure
Aetna Scientific
American Instrument
Autoclave Engineer
Barnstead Still
Central Scientific
Industrial Process Engr.
Lennard & Co.
Parr Instrument
Precision Scientific
Pressure Products Ind.
Quaid Fabricators
Ruska Inst. Corp.
Will Corp.

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Align-A-Scope, Inc.
American Inst. Co.
Bray Optical Co.
Clark & Sons
Davidson Mfg.
Dusenbery Co.
Engis Equipment
Ercona Corp.
Farrand Optical
Fecker, J. W.
Fish-Schurman Corp.
Gaertner Scientific
Georator Corp.
Gordon Enterprises
Griswold Mfg. Co.
Gurley, W. & L. E.
International Dev.
Jarrell-Ash Co.
Kollmorgen Optical Co.
Lindly & Co.
Mann Co., W. I.
Optical Service & Dev.
Parr Inst.
Penn Optical & Inst.
Perkin-Elmer Corp.
Unertl Optical Co.
Zeiss, Inc., Carl

AUTOMOTIVE SERVICE INSTRUMENTS
Aeromarine Inst. Co.
Airdraulics Engineering
Bacharach Indus. Inst.
Bear Mfg. Co.
Cambridge Inst. Co.
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Electric Heat Control
Engelhard, Chas.
Engineering Res. & Dev.
Engler Instrument
Fox Valley Inst.
Hays Corp.
Hickok Elec. Inst. Co.
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Lewis Engineering
Marsh Corp.
Potter Co.
Rieker Inst. Co.
Schauer Mfg. Co.
Scott, Inc., Hermon
Triplett Elec. Inst.
Westberg Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

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Aeromarine Inst. Co.
Aeroequip Corp.
Air Associates
Aircraft Electronic Assoc.
Airdraulics Engineering
Alden Electronic
Allard Instruments
American Meas. Inst.
American Paulin System
American Research
Aviation Engineering
Avien Inc.
Avion Div.
Bailey Meter Co.
Bendix Aviation Corp.
Boonton Radio Corp.
Brush Electronics Co.
Burton Mfg.
CDC Control
Cities Service Oil Co.
Coleman Instrument
Collins Radio Co.
Consolidated Engg.
Cook Electric
Daco Machine & Tool
Datran Engg.
De Jur-Amsco Corp.
Doelcam Div.
Eclipse-Pioneer Div.
Edcliff Instruments
Edison Inc., Thomas A.
Engineering & Res. Corp.
Fecker, Inc.
Federal Telegraph Co.
Fischer & Porter
Fish-Schurman Corp.
Flight Research Eng.
Ford Instrument
Gadgets, Inc.
General Elec. Co.
General Mills Inc.
Genisco, Inc.
Giannini & Co., G. M.
Guardian Elec. Mfg.
Hanson-Gorrill-Brian, Inc.
Haydon Mfg. Co.
Ideal Lab. Tool
Impact Register Co.
Industrial Test Equip.
Instr. Associates
International Std. Trading
Jardur Import
Kearfott Co.
Kollsman Inst.
Lear Inc.
Lewis Engineering
Machlett & Son
Manning, Maxwell, Moore
Marion Electrical Inst.
Matisa Equipment
Maxson Corp.
Midwestern Instruments
Norden-Ketay Corp.
North American Inst. Co.
Penn Ind. Inst. Corp.
Rahm Inst., Inc.
Reeves Instruments
Revere Corp.
Rochester Mfg. Co.
Schwien Eng.
Sensitive Research Inst.
Servomechanisms, Inc.
Specialties, Inc.
Sperry Gyroscope
Standard Products Inc.
Summers Gyroscope
Televiso Co.
Tenney Engineering Co.
Topp Industries, Inc.
Trimount Inst. Co.
Triplett Elec. Inst.
U. S. Gauge
Wallace & Tiernan
Westinghouse Elec.
Weston Elec. Inst.
Westport Electric
White Co., David
Wiancko Engineering
Winslow Co.

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Bliss & Co.
Collins Radio
Dusenbery Co.
Eastern Science Co.
Eastern Specialty Co.
Ercona Corp.
Fecker, J. W.
Fish-Schurman Corp.
Flight Research Eng.
Gaertner Scientific Corp.
Garlynn Eng'ng Co.
Gordon Enterprises
Gurley, W. & L. E.
Hand & Sons
International Dev. Co.
Kearfott Co., Inc.
Keuffel & Esser Co.
Kollmorgen Optical Co.
Kollsman Instrument
Lear, Inc.
Leupold & Stevens
Lindly & Co.
Meyer Co., Hugo
Negus, T. S. & J. D.
Norden-Ketay Corp.
Pacific Scientific
Penn Optical & Inst.
Ritchie & Son
Schwien Engg.
Stafford Co.
Summers Gyrescope
Testing Machines Inc.
Unertl Optical Co.
Warren-Knight Co.
White Co., David
Wollensak Optical

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Ainsworth & Sons
American Balance
Baird Associates
Becker Div., Christian
Brinkmann Instruments
Burrell Corp.
Central Scientific Co.
Chicago Apparatus Co.
Dietert Co.
Exact Weight Scale Co.
Fisher Scientific Co.
Gurley, W. & L. E.
Heusser Instrument
Jarrell-Ash Co.
Microchemical Service
Opplem Co., Inc.
Pfaltz & Bauer, Inc.
Physics Research Labs.
Roller-Smith
Seedburo Equipment
Seederer-Kohlbusch, Inc.
Testing Machines, Inc.
Thomas Co., Arthur H.
Thompson Balance
Torsion Balance Co.
Troemner, Henry
Voland & Sons
Welch Scientific
Will Corp.

BALANCES, Assay
Ainsworth & Sons
Brinkmann Instruments
Central Scientific Co.
Exact Weight Scale
Heusser Instrument
Jarrell-Ash Co.
Roller-Smith
Seederer-Kohlbusch, Inc.
Thompson Balance
Troemner, Henry
Voland & Sons

BALANCES, Automatic Recording
Avion Div.
Brinkmann Instruments
Burrell Corp.
Engineering Res. & Dev.
Exact Weight Scale Co.
Fielden Instrument
Gilmore Industries Inc.
Hadley Assoc.
Nalley, Leonard L.
Roller-Smith
Seederer-Kohlbusch, Inc.
Taller & Cooper
Thayer Scale & Eng'ng
Voland & Sons
Will Corp.

BALANCES, Bullion
Becker Div., Christian
Brinkmann Instruments
Burrell Corp.
Exact Weight Scale
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.

BALANCES, Gas Density
Burrell Corp.
Central Scientific Co.
Electrical Develop.
Exact Weight Scale Co.
Hagan Corp.
Refinery Supply Co.
Thomas Co., Arthur H.

BALANCES, Hydrostatic
Central Scientific Co.
Chicago Apparatus Co.
Seederer-Kohlbusch, Inc.

BALANCES, Jewelers
American Balances
Becker Div., Christian
Dixon, Wm., Inc.
Hadley Assoc.
Roller-Smith
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.

BALANCES, Joly's
Central Scientific Co.
Eberbach Corp.
Standard Science Supply
Torsion Balance Co.
Welch Scientific

BALANCES, Magnetic
Exact Weight Scale
Georator Corp.
Instrument Lab., Inc.
Seederer-Kohlbusch, Inc.
Voland & Sons
Will Corp.

BALANCES, Magnetic (Geophysical)
Century Geophysical
Edin Electronics
Geophysical Instrument
Georator Corp.
Ruska Inst. Corp.

BALANCES, Micro
Ainsworth & Sons
American Balance
Becker Div., Christian
Brinkmann Instruments
Burrell Corp.
Cady & Co., E. J.
Canadian Radium
Central Scientific Co.
Exact Weight Scale Co.
Heusser Instrument
Jarrell-Ash
Microchemical Service
Microchemical Specialties
Opplem Co., Inc.
Pfaltz & Bauer, Inc.
Seederer-Kohlbusch, Inc.
Thomas Co., Arthur H.
Torsion Balance Co.
Voland & Sons, Inc.
Will Corp.

BALANCES, Precision for Weights & Measures
Ainsworth & Sons
American Balance
Arga Div.
Becker Div., Christian
Brinkmann Instruments
Burke & James
Burrell Corp.
Cady & Co., E. J.
Central Scientific Co.
Chatillon & Sons
Coleman Inst.
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Gurley, W. & L. E.
Hadley Assoc.
Heusser Instrument
Jacobs Bros. Co.
Jarrell-Ash
Ohaus Scale Co.
Pfaltz & Bauer, Inc.
Roller-Smith
Seedburo Equipment
Seederer-Kohlbusch, Inc.
Streeter-Amet
Thompson Balance
Torsion Balance Co.
Troemner, Henry
Voland & Sons, Inc.
Welch Scientific Co.
Will Corp.

BALANCES, Pulp
Becker Div., Christian
Burrell Corp.
Central Scientific Co.
Exact Weight Scale
Heusser Instrument
Jacobs Bros. Co.
Seederer-Kohlbusch, Inc.
Testing Machines, Inc.
Thompson Balance
Thwing-Albert Inst. Co.
Torsion Balance Co.
Voland & Sons, Inc.
Will Corp.
Williams Apparatus Co.

BALANCES, Specific Gravity
Baird Associates
Becker Div., Christian
Brinkmann Instruments
Burrell Corp.
Central Scientific
Chicago Apparatus Co.
Eberbach Corp.
Electrical Develop.
Exact Weight Scale Co.
Fisher Scientific
Hadley Assoc.
Heusser Instrument
Humboldt Mfg. Co.
Ohaus Scale Corp.
Pfaltz & Bauer, Inc.
Refinery Supply
Roller-Smith
Ruehfel Co.
Seederer-Kohlbusch, Inc.
Standard Science Supply
Thomas Co., Arthur H.
Toledo Scale Co.
Torsion Balance Co.
Troemner, Henry
Welch Scientific
Will Corp.

BALANCES, Surface Tension
Brinkmann Instruments
Central Scientific Co.
Exact Weight Scale Co.
Roller-Smith Co.
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Will Corp.

BALANCES, Triple Beam
Central Scientific
Dietert Co., Harry W.
Exact Weight Scale Co.
Fisher Scientific Co.
Hadley Assoc.
Humboldt Mfg. Co.
Ohaus Scale Corp.
Refinery Supply Co.
Seedburo Equipment
Seederer-Kohlbusch, Inc.
Testing Machines, Inc.
Troemner, Henry
W. M. Welch Scientific Co.
Will Corp.

BALANCES, Volumetric Flask
Becker Div., Christian
Central Scientific
Seederer-Kohlbusch, Inc.
Torsion Balance Co.
Will Corp.

BALANCES, Westphal
Becker Div., Christian
Central Scientific Co.
Chicago Apparatus Co.
Fisher Scientific
Pfaltz & Bauer, Inc.
Torsion Balance Co.
Seederer-Kohlbusch, Inc.
Troemner, Henry
W. M. Welch Scientific Co.
Will Corp.

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Bear Mfg. Co.
Cosa Corp.
Decker Aviation
DoAll Co.
Electronic Corp.
Exact Weight Scale
Ferner Co.
GE Apparatus Sales
Gisholt Machine Co.
Globe Tool & Engg.
Instr. Associates

International Res. & Dev.
Kahn & Co.
Minnesota Electronics
Olsen Testing Machine
Pacific Scientific
Ten Bosch Inc., M.
Westinghouse Elec.

BALANCING MACHINES, STATIC
Anderson Bros. Mfg. Co.
Annis Co., R. B.
Best Mfg. Co.
Cosa Corp.
Exact Weight Scale
Ferner Co.
Gisholt Machine Co.
Gelber, Saml. S.
Globe Tool & Engg.
International Res. & Dev.
Micro-Poise Eng.
Olsen Testing Machine
Pacific Scientific
Sundstrand Machine Tool
Taylor Dynamometer
Toledo Scale Co.

BALLAST TUBES, Current Regulators
Amperite Corp.
Chatham Electronics
Clarostat Mfg. Co.
GE Tube Dept.
Industro, Inc.
International Std. Trad.
Olympic Dev. Co.
Philco Corp.
Westinghouse Electric

BALLISTIC INSTRUMENTS, Crime Detection (See Microscopes, Ballistic Comparison)

BALLISTIC INSTRUMENTS, Electrical
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Atlantic Research
Berkeley Scientific
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Cambridge Inst. Co.
Control Devices Inc.
Detectron Co.
Epsco, Inc.
Feedback Controls
General Elec. Co.
Gulton Mfg.
Hickok Elec. Inst. Corp.
Jacobs Instruments
Kay Electric Co.
Leeds & Northrup Co.
Micro Balancing, Inc.
Potter Instrument
Precision Ther. & Inst.
Rawson Electrical Inst.
Rubicon Co.
Sensitive Research Inst.
Topp Industries Inc.
Triplett Elec. Inst.
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BALLISTIC INSTRUMENTS, Ordnance
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AiResearch Mfg.
Atlantic Research
Bausch & Lomb Opt.
Beckman & Whitley
Berkeley Scientific
Cambridge Inst. Co.
Chesapeake Inst.
Epsco, Inc.
Ercona Corp.
Fecker, Inc.
Feedback Controls
Fish-Schurman Corp.
Genisco, Inc.
Gordon Enterprises
Jacobs Instruments
Kay Electric Co.
Maxson Penn Optical
Potter Instrument
Precision Therm. & Inst.
Rawson Elec. Inst. Co.
Reeves Instrument
Rutico, Inc.
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Bendix Aviation Corp.
Burton Mfg. Co.
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General Electric
Ideal Lab. Tool
Instr. Associates
Rahm Inst., Inc.
Schwien Engineering
Summers Gyroscope
Vectron, Inc.

BANK & TURN INDICATOR TESTERS
Doelcam Div.
Globe Industries, Inc.
Ideal Lab. Tool
Instr. Associates
Schwien Engineering Co.
Standard Products Inc.

BARKOMETERS
Central Scientific Co.
Kahl Scientific Inst.
Freas Glass Works
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G. M. Mfg. Co., Inc.
Griebel Co.
H-B Inst. Co., Inc.
Hiergesell & Sons
Moeller Instrument Co.
Precision Therm. & Inst.
Ruehfel Co.
Taylor Inst. Cos.
Weksler Thermometer
Weston Elec. Inst.

BAROGRAPHS (See Barometers, Recording)

BAROMETERS, Altitude
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Aeromarine Inst. Co.
American Paulin
Bendix Aviation Corp.
Bowen & Co.
Bruning Co.
Eclipse-Pioneer Div.
Friez Instrument Div.
General Mills Inc.
Giannini & Co.
Green, Henry J.
H & H Thermostats
Hass Bros. Inst.
Ideal Lab. Tool
Instr. Associates
Instruments Corp.
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman Instrument
Matisa Equipment
Meriam Inst. Co.
Mine Safety App. Co.
Norden Inst. Co.
Panoramic Radio Co.
Post Co.
Precision Thermometer
Scope Instrument
Square D Co.
Stratex Instrument Co.
Taylor Inst. Cos.
Technicraft Engg.
Thermometer Corp.
Thwing-Albert Inst. Co.
Wallace & Tiernan
Warren Knight Co.
Welch Scientific
Westinghouse Elec.
White Co.
Wiancko Engineering

BAROMETERS, Aneroid
Aeromarine Inst. Co.
American Paulin
Bendix Aviation Corp.
Central Scientific Co.
Chelsea Clock Co.
E. Dietzgen Co.
Eclipse-Pioneer Div.
Fisher Scientific
Friez Instrument
Green, Henry J.
Ideal Lab. Tool
Instruments Corp.
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman Instrument
Mine Safety App. Co.
Negus, T. S. & J. D.
Post Co.
Precision Instrument
Scientific Inst. Co.
Scope Instrument
Serdex, Inc.
Square D Co.
Standard Thermometer
Stewart, M. C.
Taylor Inst. Cos.
Testrite Instrument Co.
Thermometer Corp.
Wallace & Tiernan
Warren Knight Co.
White Co.

BAROMETERS, Mercurial
Alpha Instrument Co.
Bendix Aviation Corp.
Builders-Providence
Central Scientific Co.
Chicago Apparatus Co.
Dietert Co.
Eberbach Corp.
Eclipse-Pioneer Div.
Fish-Schurman Corp.
Fisher Scientific Co.
Friez Instruments
Gaertner Scientific
Green, Henry J.
Greiner, Glassblowing Lab.
Hass Bros. Inst.
Hiergesell, Wm. & Sons
Ideal Lab. Tool
Instruments Corp.
Kessler Co.
Kollsman Instrument
Manning, Maxwell & Moore
Meriam Inst. Co.
Moeller Instrument Co.
Negus, T. S. & J. D.
Precision Thermometer
Refinery Supply Co.
Sargent & Co., E. H.
Scientific Glass App.
Scientific Inst. Co.
Specialty Glass Co.
Standard Science Sup.
Stoelting Co.
Taylor Inst. Cos.
Thermometer Corp.
Trimount Inst. Co.
Uehling Instrument Co.
Universal X-Ray Prods.
Wallace & Tiernan
Weksler Thermometer
W. M. Welch Scientific Co.
Weston Elec. Inst.

BAROMETERS, Recording
Alden Products
Alfax Paper
American Paulin
Bacharach Ind. Inst.
Bendix Aviation Corp.
Bristol Co.
Dickson Co.
E. Dietzgen Co.
Foxboro Co.
Friez Instrument
Geotechnical
Green, Henry J.
Hathaway Instrument
H & H Thermostats
Ideal Lab. Tool
Impact Register
Instruments Corp.
Kenyon Instrument Co.
Keuffel & Esser Co.
Minneapolis-Honeywell
Penn Ind. Inst. Div.
Serdex, Inc.
Taylor Inst. Cos.
Uehling Instrument Co.
United Scientific Co.

BAROMETERS, Station
American Paulin
Bendix Aviation Corp.
Friez Instrument
Green, Henry J.
Ideal Lab. Tool
Kollsman Instrument
Precision Thermometer
Square D Co.
Taylor Inst. Cos.
Universal X-Ray Prods.
Wallace & Tiernan

BAROMETRIC PRESSURE INDICATORS
American Paulin
Avion Div.
Bendix Aviation Corp.
Bristol Co.
Electronic Products
Foxboro Co.
Friez Instrument
General Mills Inc.
Giannini & Co., Inc.
Green, Henry J.
Ideal Lab. Tool
Instrument Corp.
Kenyon Instrument Co.
Keuffel & Esser Co.
Kollsman
Manning, Maxwell & Moore
Meriam Inst. Co.
Moeller Instruments
Norden-Ketay Corp.
Pioneer Inst. Co.
Precision Thermometer
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Serdex, Inc.
Servonic Insts., Inc.
Statham Labs.
Taylor Inst. Cos.
Uehling Instrument Co.
Wallace & Tiernan
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BAROMETRIC PRESSURE RECORDERS (See Barometers, Recording)

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American Research
Blue M Electric
Bowser Inc.

PRECISION – MERCURIAL
BAROMETERS – MANOMETERS

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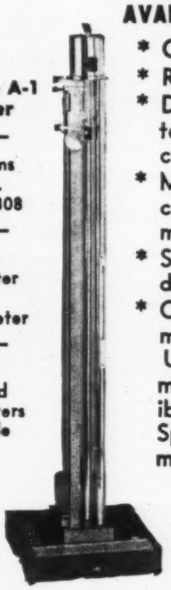

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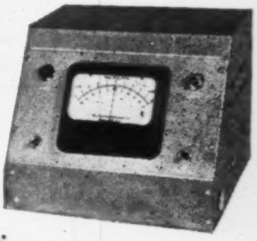

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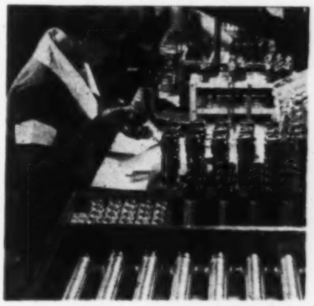

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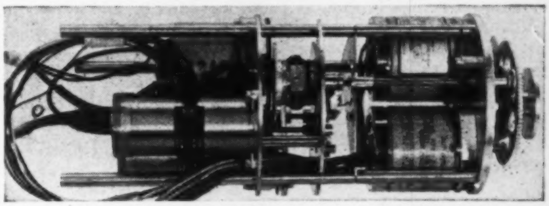

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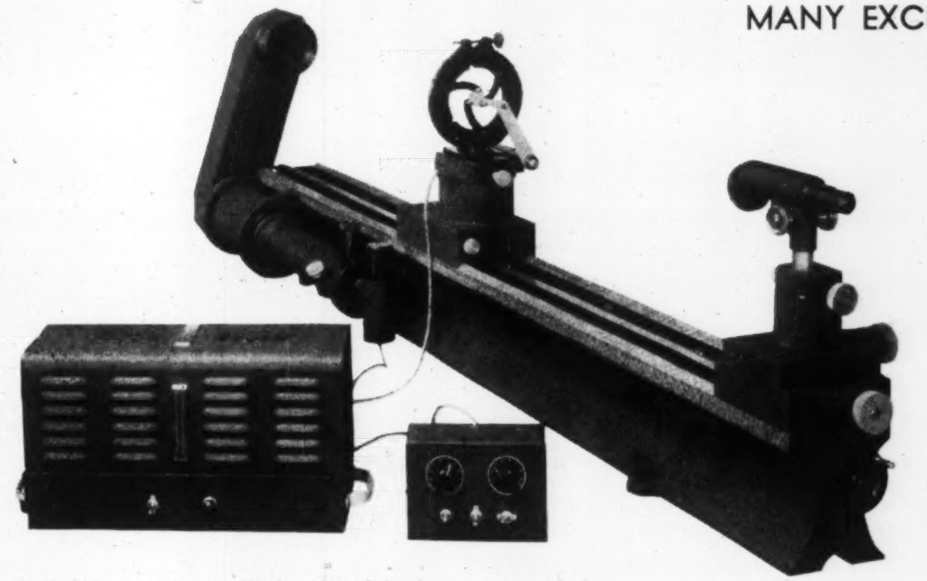

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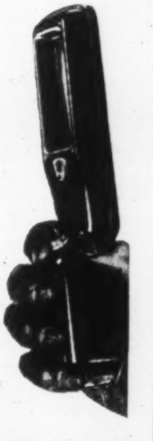

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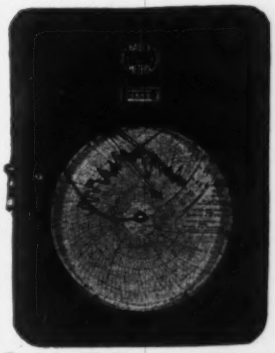

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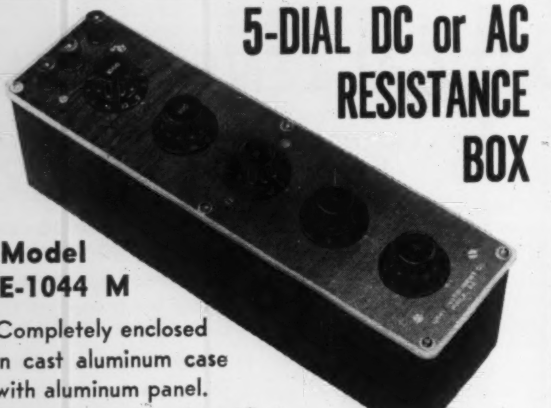

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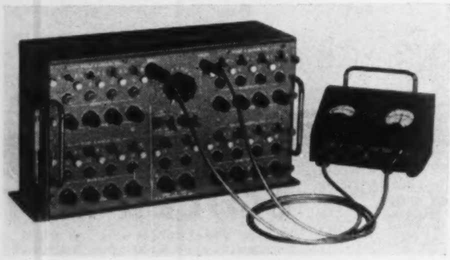

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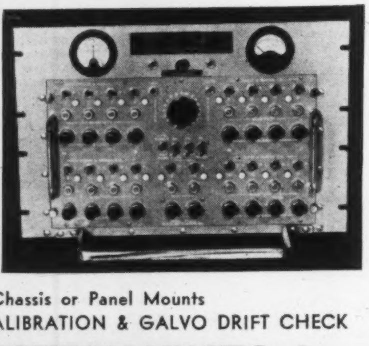

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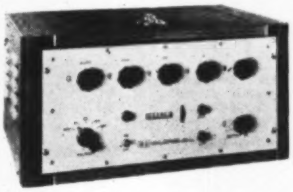

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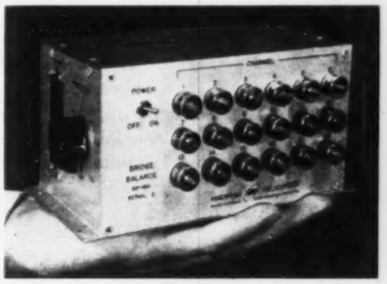

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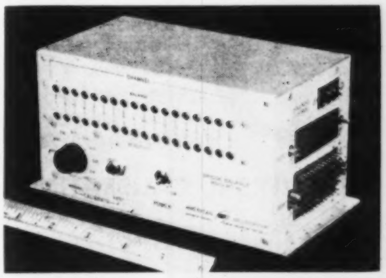

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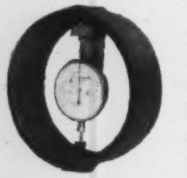

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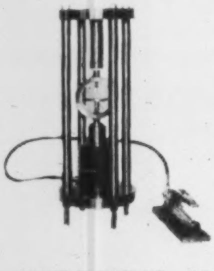

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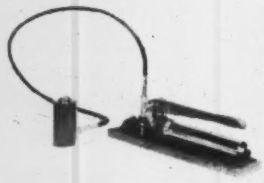

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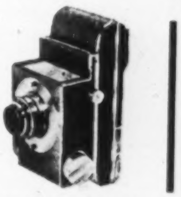

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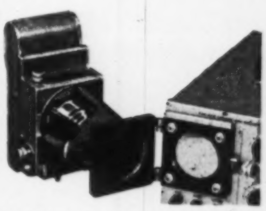

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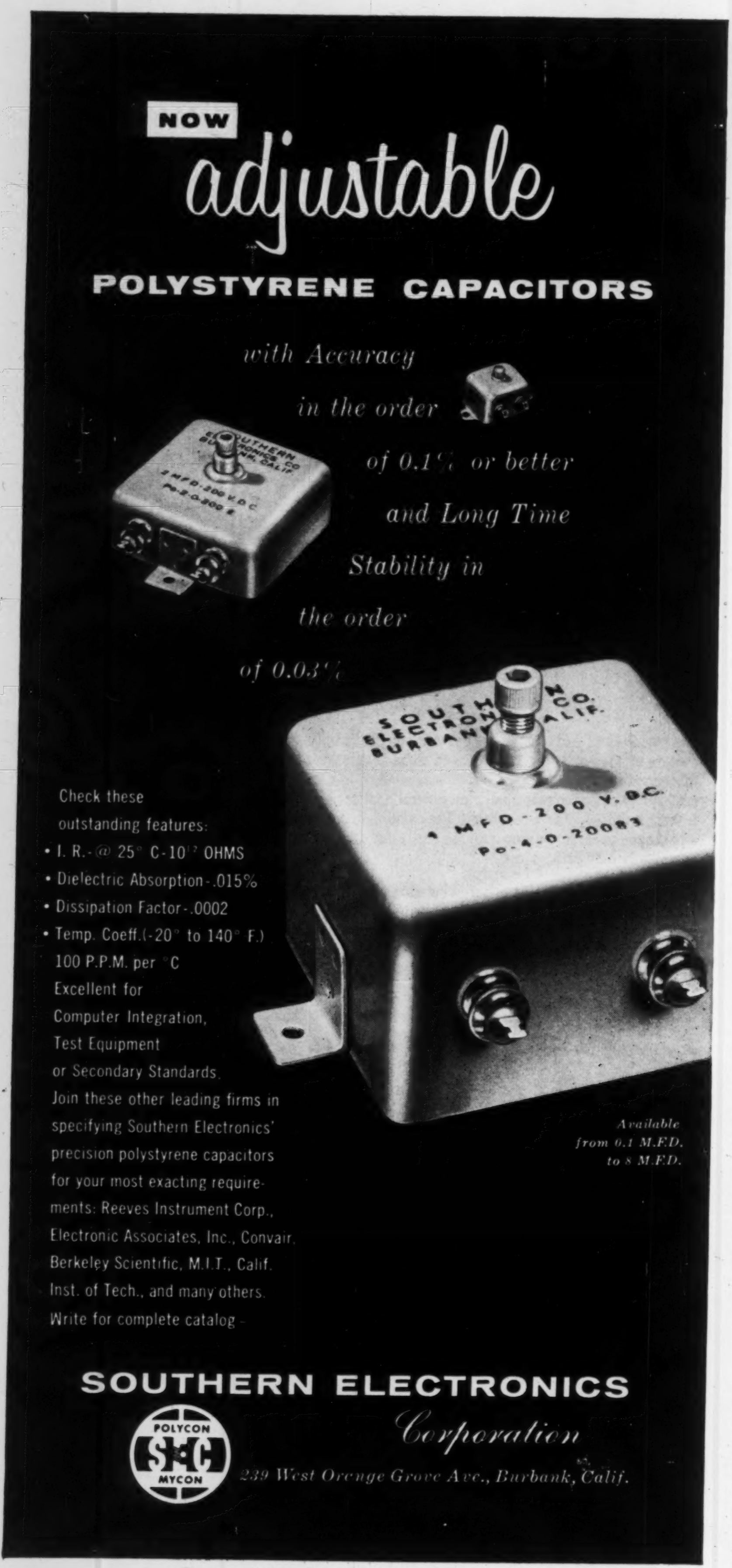

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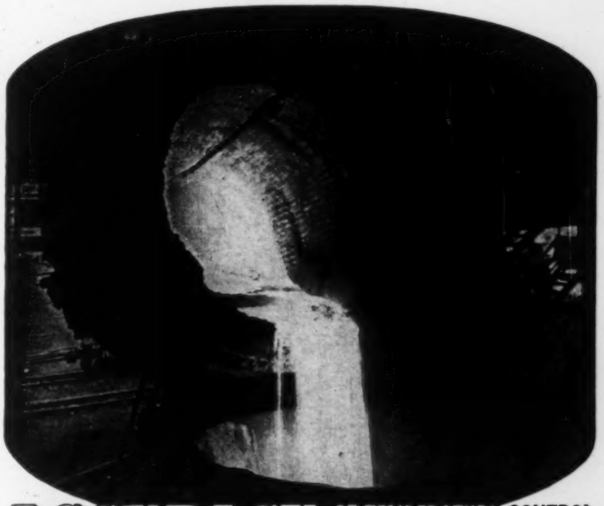

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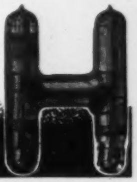

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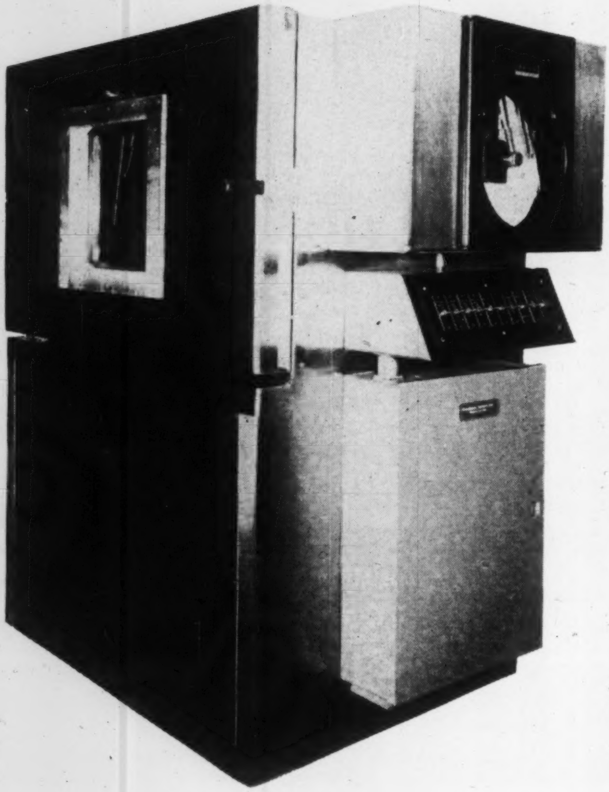

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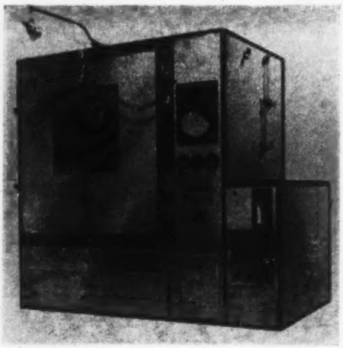

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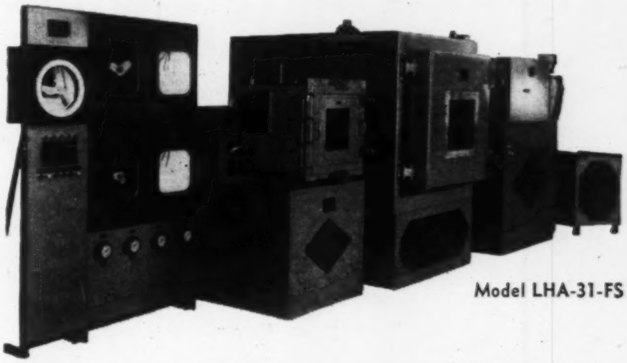

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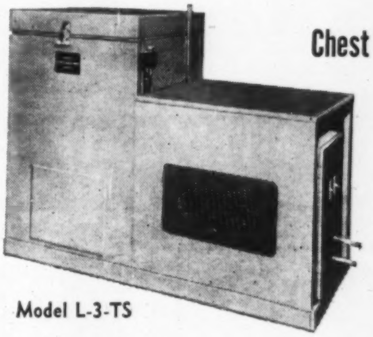

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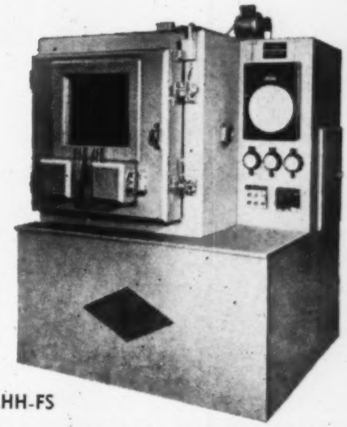

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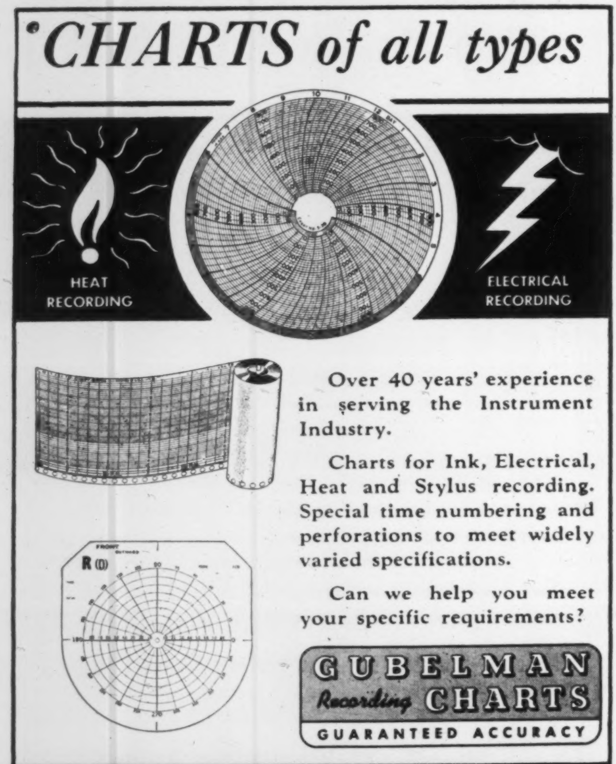

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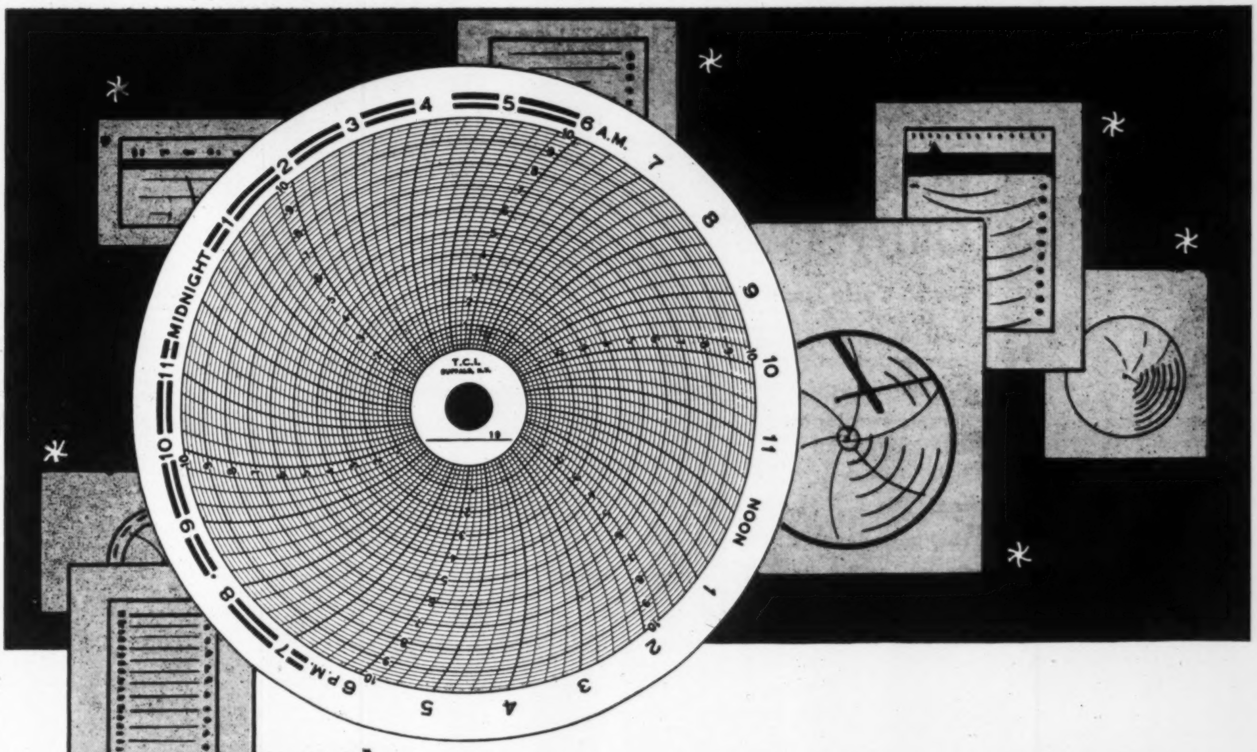
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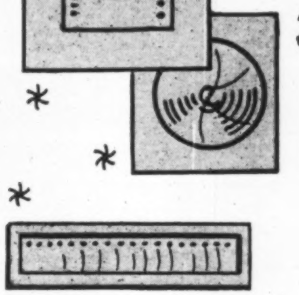

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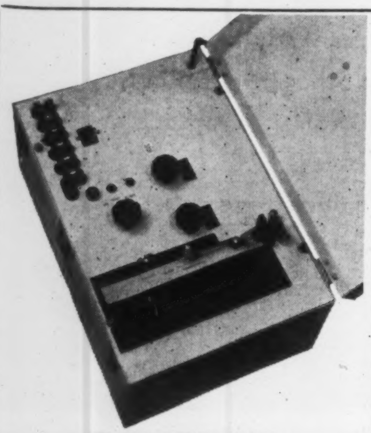

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Sterling Transformer
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Sylvania Elec. Prod.
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Texas Instruments
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Thordarson-Meissner
Torwico Electronics
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Trenton Transformer
United States Electronics
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Instrument Development
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Magnetic Research
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Metron Instrument
Nelson & Street
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Potter Instrument
Precision Thermometer
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Sticht Co.

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Elgin National Watch
Gaertner Scientific
Geotechnical Corp.
Hamilton Watch
Jardur Import Co.
Negus, T. S. & J. D.
Potter Instrument
Standard Electric Time
Stoelting Co., C. H.
Waltham Watch Co.

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Berkeley Scientific
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Geotechnical Corp.
Gordon Enterprises
Potter Instrument
Process & Instruments
Rawson Elec. Inst.
Standard Electric Time
Sticht Co.
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Esterline-Angus
E-T-A Products
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Elektro-Serv Corp.
El Mec Labs.
Engr. Research & Dev.
Flett Lab.
GE Electronics Div.
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Gurley, W. & L. E.
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Hastings Inst.
Hausser & Son
Insulated Circuits
Kay-Lab
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Lab-Tronics
Lear, Inc.
Librascope, Inc.
Micro-Circuits Co.
PCA Electronics Inc.
Photocircuits Corp.
Raytheon Mfg. Co.
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Stupakoff Ceramic
Sylvania Elec. Prod.
Topp Industries, Inc.
Tri-Dex Electronics
Union Switch
Westinghouse Electric

CIRCUITS, Plug-in (See Plug-in Circuits)

CIRCUITS, Printed Electric (See Circuits, Graphic)

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Electronic Control Systems
Federal Classifier
Fisher Scientific
Robinette Co.

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Chicago Apparatus
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Fisher Scientific
Moore Corp., John B.
Passaic Analytical Labs.
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Sperry-Sun Well Survey'g

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Alfax Paper & Eng.
Deitzgen Co.
Geier & Bluhm, Inc.
Leeds & Northrup
Stoelting Co., C. H.
White Co., Inc., David

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Engis Equipment
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Ferner Co.
Geier & Bluhm, Inc.
Jarrell-Ash Co.
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Leupold & Stevens
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Moeller Instrument
Negus, T. S. & J. D.
Opplem Co., Inc.
Precision Thermometer
Rahm Inst., Inc.
Sperry-Sun Well Surveying
Warren-Knight Co.

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Jarrell-Ash
Keuffel & Esser
Stratex Instrument Co.

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Marine Compass
Moeller Inst. Co.
Negus, T. S. & J. D.
Northwest Instrument
Precision Thermometer
Rahm Inst., Inc.
Serdex, Inc.

CLIPS, Electrical Testing

Mueller Electric

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Elgin-Neomatic, Inc.
Gaertner Scientific Corp.
General Electric Co.
International Bus. Mach.
Jacobs Instruments
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New Haven Clock
Phipps & Bird
Research Controls
Simplex Time Rec.
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Stromberg Time Corp.
Telechron Dept.
Thomas Clock Co.
Wallace & Tiernan
Waltham Watch

CLOCKS, Minute Impulse & Synchronous

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New Haven Clock
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Stoelting Co.
Stromberg Time Corp.
Telechron Dept.
Thomas Clock Co.
Thompson Clock Co., H. C.
Tork Clock
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National Time & Signal
New Haven Clock
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Stromberg Time Corp.
Telechron Dept.
Thomas Clock Co.
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CLOCKS, Secondary

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General Elec. Co.
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National Time & Signal
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Kollsmann Instrument
Lindly & Co.
Link Aviation Devices
Los Angeles Scientific Instr.
Mann Co.
Meyer & Co., Hugo
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Norden-Ketay Corp.
Perkin-Elmer Corp.
Phoenix Precision Inst.
Stocker & Yale
Unertl Optical Co.
White Co. Inc.
Wild Heerbrugg
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Avion Div.
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Berkshire Laboratories
Central Scientific Co.
Dearborn Scientific
De-Tec-Tronic Labs.
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Ercona Corp.
Ess Inst. Co.
Farrand Optical
Fish-Schurman Corp.
Fisher Scientific Co.
Gaertner Scientific Corp.
Gardner Laboratory
G E Apparatus Sales
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Huggins Labs.
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Jacobs Instrument
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Kaye Development
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Lafayette Instrument Co.
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Meyer & Co., Hugo
Pfaltz & Bauer, Inc.
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Photovolt Corp.
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Rubicon Co.
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Testing Machines, Inc.
Westinghouse Elec.
Willmotte, Inc.
Zeiss, Inc., Carl

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Fisher Scientific Co.
Gaertner Scientific Corp.
Gardner Laboratory
Hausser & Son
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International Dev. Co.
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Klett Mfg. Co.
Koehler Instrument
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Taylor & Co., W. A.
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Zeiss, Inc., Carl

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COLOR MATCHING OUTFITS (See Color Comparators, Visual)

COLORIMETER TUBES (See Colorimeters, Visual)

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Technical Products
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Zeiss, Inc., Carl

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COMBUSTION INDICATORS AND RECORDERS (See Gas Analyzers, Boiler Meters, etc.)

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West Coast Electronics
Westinghouse Elec.
Weston Elec. Inst. Corp.

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Arga Division
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Cal-Tronics Corp.
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DoAll Co.
Engineering & Res. Corp.
Feller Engineering
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Phaostron Co.
Rainhart Co.
Scott, Inc., Hermon H.
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Sheffield Corp.
Thordarson-Meissner
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Borden Engineering
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Clevite-Brush
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G E Apparatus Sales
G E Instrument Dept.
Industrial Electronics Inc.
Link Engineering
National Inst. Co.
Phototron Inst. Corp.
Scherr Optical Tools
Sheffield Corp.
Size Control Co.
Stocker & Yale
Surface Checking Gage
Swedish Gage Co.

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Airpath Instrument
Autoflight Inst. Div.
Bendix Aviation Co.
Borg. Corp.
Eclipse-Pioneer Div.
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Giannini & Co.
Hull Mfg. Co.
Instr. Associates
Kearfott Co., Inc.
Koehler Instrument
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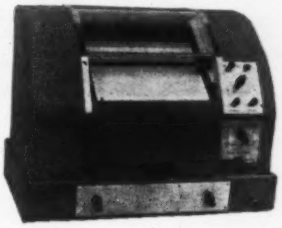
Marine Compass
Matisa Equipment
Moisture Register Co.
Norden-Ketay Corp.
RCA Div.
Sperry Gyroscope Co.
Star Compass Co.
Summers Gyroscope
Suverkrop Instruments
U. S. Gauge Co.
Waltham Watch



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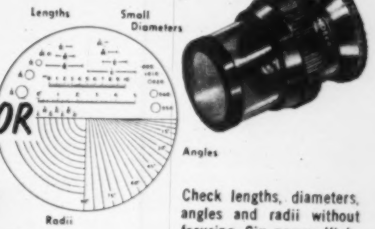

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Wild Heerbrugg

COMPASSES, Dip
Dusenbery Co.
Garlynn Eng'ng Co.
Gurley, W. & L. E.
Keuffel & Esser Co.
Marine Compass Co.
Los Angeles Scientific
Post Co.
Ruska Inst. Corp.
Sprengnether Inst.
Suverkrop Inst. Co.
Taylor Inst. Cos.
Warren-Knight Co.

COMPASSES, Drafting Room (See Drawing Instruments)

COMPASSES, Gyro
Aircraft Radio
Arma Corporation
Bendix Aviation Corp.
Eclipse-Pioneer Div.
Engineering Res. Assoc.
Flight Research Eng.
G E Instrument Dept.
Instr. Associates
Kearfott Co., Inc.
Lear Inc.
Norden-Ketay Corp.
Pacific Scientific
Sperry Gyroscope Co.
Vectron, Inc.

COMPASSES, Luminous prismatic
Brunson Instrument
Deitzgen Co.
Kollsman Instrument
Marine Compass Co.
Ritchie & Son.
Scope Instrument
Suverkop Instruments
Taylor Inst. Cos.
White Co., Inc., David

COMPASSES, Magnetic
Aeromarine Inst. Co.
Ainsworth & Sons
Airpath Instrument
Baker Compass Co.
Bendix Aviation Corp.
Berger & Sons
Brunson Instrument
Central Scientific
Deitzgen Co.
Dirigo Compass & Inst.
Dusenbery Co.
Eclipse-Pioneer Div.
Electro-Mec Lab.
Flight Research Co.
Garlynn Eng'ng Co.
General Elec. Co.
Georator Corp.
Gurley W. & L. E.
Hand & Sons
Hull Mfg. Co.
Instr. Associates
Kearfott Co., Inc.
Keuffel & Esser Co.
Kollsman Inst.
Leupold & Stevens
Marine Compass Co.
Marshall Co.
Negus T. S. & J. D.
Norden-Ketay Corp.
Northwest Instrument
Post Co.
Ritchie & Son
Ruska Instrument
Standard Science Supply
Star Compass Co.
Summers Gyroscope
Suverkop Instruments
Taylor Inst. Cos.
Testrite Instrument Co.
Thermometer Corp.
U. S. Gauge Co.
Waltham Watch
Warren-Knight Co.
W. M. Welch Scientific Co.
David White Co., Inc.

COMPASSES, Marine
Aeromarine Inst. Co.
Airpath Instrument
Arma Corporation
Baker Compass Co.
Bliss & Co.
Bunnell Co., J. H.
Daystrom Inst.
Dirigo Compass & Inst.
Dusenbery Co.
Georator Corp.
Hand & Sons
Hull Mfg. Co.
Lear, Inc.
Marine-Compass Co.
Negus T. S. & J. D.
Northwest Instrument
Ritchie & Son
Sperry Gyroscope Co.
Starr Compass Co.
W. M. Welch Scientific Co.

COMPASSES, Radio
Bendix Aviation Corp.
Eclipse-Pioneer Div.
Fairchild (Syosset)
Fisher Research Lab.
Hickok Elec. Inst. Co.
Kaar Engn'ng
Kearfott Co., Inc.
Lear, Inc.
Northwest Instrument
RCA Div.
Thordarson-Meissner
Triumph Mfg. Co.

COMPASSES, Ship (See Compasses, Marine)

COMPASSES, Telitale (See Compasses, Marine)

COMPENSATION, Magnetic
Aeromarine Inst. Co.
Airpath Instrument
Dusenbery Co.
Georator Corp.
Hand & Sons
Marine Compass
Moore Corp., John B.

COMPRESSORS, Instrument Air
Gast Mfg. Co.
Ingersoll-Rand
Lammert & Mann Co.
Lavoie Laboratories
Little, Inc., Arthur
Minneapolis-Honeywell
Nash Engineering
Norden-Ketay Corp.
Pennsylvania Pump
Powers Regulator Co.
U. S. Gauge Co.

COMPUTERS, ANALOG
ACF Electronics
Aero Electronics
Air Associates
AiResearch Mfg.
American Mach. & Foundry
Arma Corp.
Atomic Instrument
Audio Instrument
Austin Co.
Avion Div.
Berkeley Scientific
Boeing Airplane Co.
Cal-Tronics
Cedar Engineering
C.G.S. Labs.
Computer Corp. of Am.
Computer Engg. Assoc.
Datran Engg. Corp.
Daystrom Instrument
Donner Scientific
Dynalysis Development
Electronic Associates
Engineering & Res. Corp.
Epsco, Inc.
Farrand Optical Co.
Ford Instrument
Goodyear Aircraft
Hanson-Gorrill-Brian
Hathaway Inst. Co.
Industrial Gauges Corp.
Inst. Components, Inc.
Librascope, Inc.
Link Aviation
L & O Res. & Dev.
Mid-Century Instrumatic
Miller Corp.
Norden-Ketay Corp.
North American Philips
Panellit, Inc.
Philbrick Researches
Raytheon Mfg.
Reeves Inst. Corp.
Remington Rand
Servo Corp. of America
Servomechanisms, Inc.
Specialties, Inc.
Sterling Precision
System Analyzer Corp.
Taller & Cooper, Inc.
Topp Industries
Ultrasonic Corp.
Vectron, Inc.
Wang Labs.
Weston Elec. Inst.
Westronics, Inc.

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ACF Electronics
Aero Electronics
Air Associates
Arma Corp.
Atomic Inst.
Austin Co.
Avion Div.
Bendix Aviation
Burroughs Corp.
Cal-Tronics
C.G.S. Labs.
Clevite-Brush
Computer Control
Consolidated Engg. Corp.
Daystrom Instrument
Electro-Data Corp.
Electronic Computer Div.
Electronic Control Systems
Electronics Corp. of Amer.
Engineering & Res. Corp.
Epsco, Inc.
Ferranti Electric
Ford Instrument
GE Apparatus Sales
Hogan Labs.
International Bus. Mach.
International Telemeter

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Librascope, Inc.
Logistics Research
Loral Electronics
Marchant Research
Minnesota Electronics
Monroe Calculating
Mountain Systems, Inc.
National Cash Register
Norden-Ketay
North American Philips
Potter Instrument
Radio Corp. of Amer.
Raytheon Mfg.
Rea Co., Inc., J. B.
Remington Rand
Servo Corp. of Amer.
Sterling Precision
Taller & Cooper, Inc.
Technitrol Engg. Co.
Telecomputing Corp.
Ultrasonic Corp.
Walkirt Co.
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COMPUTERS, Simultaneous Equation
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Airborne Instruments Lab.
American Electronic Corp.
Arma Corp.
Austin Company
Avion Div.
Berkeley Scientific Div.
Boeing Airplane Co.
Cal-Tronics Corp.
Computer Corp.
Consolidated Engineering
Corbett Science Labs.
Doelcam Div.
Donner Scientific
Electronic Associates
Ford Instrument Co.
General Electric Co.
Gerber Scientific
Hillyer Instrument
Krohn-Hite Inst.
Laboratory for Electronics
Librascope
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Minnesota Electronics
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Philbrick Researches
Rea Company
Reeves Instrument
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CONDENSER, Electric (See Capacitors)

CONDENSER LEAKAGE, Indicators
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Doelcam Div.
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Electronic Dev. Lab.
Electronic Inst. Co. Inc.
Feller Engineering
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General Elec. Co.
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Tobe Deutschmann Corp.
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CONDENSER TESTERS (See Testers, Condenser)

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Bristol Co.
Central Scientific Co.
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Davis Emergency Equip.
Diatron Co.
Dice Co., J. W.
Doelcam Div.
Electronic Prod. Co.
Esterline-Augus Co.
Fielden Inst. Div.
Foxboro Co.
G E Apparatus Sales
General Electronic
Gray Instrument
Industrial Inst. Inc.
Instrument Lab. Inc.
Kahn & Co.
Leeds & Northrup Co.
Magnaflux Corp.
Minneapolis-Honeywell
Minnesota Electronics
Phaostron Co.
RCA Div.
Revere Corp.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
Sticht Co.
Thwing-Albert Instrument

CONES, Pyrometric
Accurate Pyrometric Cone
Fish-Schurman Co.
Gordon Co.
Henderson & Co.
Orton Ceramic Found.

CONES, Slump
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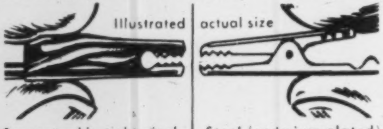

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Federal Telephone
Felts Corp.
General Elec. Co.
General Radio Co.
Grayhill, Inc.
Harvey-Wells Electronics
International Std. Trading
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Jones, Howard B., Div.
Kellogg Switchboard
Lab-Tronics
Land-Air, Inc.
Lectronic Research Labs.
Lessells Assocs.
Lewis Engineering
Mallory & Co.
Meter Devices Co.
Millen Mfg. Co.
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Pyle National
RCA
Revere Corp.
Richards Co., Inc.
Shallcross Mfg. Co.
Smith Inc., Herman H.
Standard Elec. Time
States Co.
Superior Electric
Thermo-Electric Co.
Thwing-Albert Inst. Co.
U. S. Components
Viking Electric
Wiggins Oil Tool Co.
Winchester Electronics

CONSISTENCY REGULATORS, Pulp & Paper (See Controllers, Automatic, Consistency)

CONSTANT SPEED and Frequency Sets
American Time Prods.
Bogue Electric Mfg. Co.
Cal-Tronics Corp.
Doelcam Div.
Elec. Tachometer Corp.
Gaertner Scientific Corp.
G E Apparatus Sales
Hastings Inst. Co.
Leeds & Northrup
Magnetic Instrument
Robinette Co., W. C.
Rockwell Engr.
Servo-Tek Products
Sorensen & Co.
Standard Elec. Time
Sunshine Scientific
Times Facsimile Corp.
Varo Mfg. Co.
Vectron, Inc.
Westinghouse Elec.

CONTOUR MEASURING PROJECTORS
Abrams Instrument
American Meas. Insts.
American Optical Co.
Askania Regulator
Bausch & Lomb Optical
Engis Equipment
Ercona Corp.
Ferner Co.
Fish-Schurman Corp.
Griswold Mfg. Co.
Jarrell-Ash Co.
Jones & Lamson Machine
Leitz, Inc.
Martin Hubbard Corp.
Opplem Co., Inc.
Pórtman Instrument
Scherr Optical Tools
Sheffield Corp.
Stocker & Yale
Wilder, R. S.

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Askania Regulator
Automatic Temp. Control
Avion Div.
Baltic Metal Products
Barber-Colman Co.
Barnes Co., W.F. & J.
Bristol Co.
Bud Radio, Inc.
Builders-Providence
Cal-Tronics Corp.
Continental Elect. Equip.
Control Engg. Co.
Curtis Dev. & Mfg.
Dahl & Co., G. W.
Devtronics, Inc.
Dittmore & Freimuth
Falstrom Co.
Fischer & Porter
Gaydon Co.
Industrial Control Panel
Industrial Engineering
Kahn & Co.
Karl-Douglas Assoc.
Kirk & Blum Mfg.
Lake Erie Electric
Littleford Bros., Inc.
MagElec. Prod.
Minneapolis-Honeywell
Moore Products Co.
Panellit
Proportioneers, Inc.
Ramapo Engr. Co.
Regent Controls
Richardson Scale Co.
Shallcross Controls
Standard Elec. Time
Virginia Electronics
Wheelco Inst. Div.

CONTROL DRIVES (See Servo-Motors)

CONTROL SYSTEMS, Machine Tool
American Inst. Corp.
Austin Company
Clark Controller Co.
ConRay Corp.
Control Engineering Co.
Electro Autosizing Machine
Electronic Control Systems
Farrand Optical Co.
Fish-Schurman Corp.
Franklin Electronics
G. E. Apparatus Sales
Genzliner, Inc.
Hanson-Gorrill-Brian
Industrial Electronics
Industrial Gauges Corp.
Lesells & Associates
L & O Research & Dev.
Loral Electronics Corp.
Machinery Electrification
Magnetic Inst. Co.
Mercoid Corp.
Nelson Instrument
Olympic Development
Phoenix Precision Inst.
Pratt & Whitney
Raytheon Mfg. Co.
Servospeed Div.
Servo-Tek Products Co.
Spencer Mfg. Co.
Sterling Precision
Taller & Cooper Inc.
Telecomputing Corp.
Teleflex Inc.
Tensitron, Inc.
Topp Industries
Ultrasonic Corp.
Vickers, Inc.
Webb Co., Jervis B.

"CONTROL" —NOTE—

The following pages deserve close study. Note for example that after numerous "Controllers, Automatic" there are three classes of "Controllers, Manual." Look up also under "Regulators" for many types thus termed by usage. Also "Thermostats" and other commonly-used names of specific-purpose, automatic controllers.

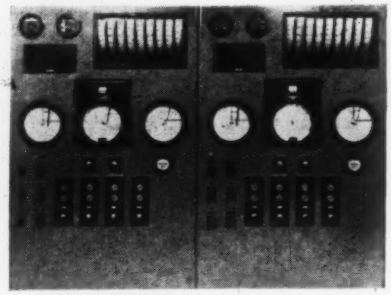
As a rule, Automatic Controllers are "Instrument like" while devices known as Controls (preceded by name of application) are simple, single-purpose devices.

CONTROLLERS, AUTOMATIC, Ammonia (See Ammonia Control Equipment)

CONTROLLERS, AUTOMATIC, Beater (See Controllers, Automatic, Consistency)

CONTROLLERS, AUTOMATIC, Bin (See Controllers, Automatic, Granular Material, Level)

CONTROLLERS, AUTOMATIC, Boiler Feed
Askania Regulator Co.
Atlas Valve Co.
Atwood & Morrill
Bailey Meter Co.
Black, Sivalls & Bryson, Inc.
Builders-Providence, Inc.
B. W. Controller
Campbell Co., J. A.
Cash Co., A. W.
Cash Valve Mfg. Corp.
Climax Div.
Combustion Control Corp.
Continental Foundry
Cutler-Hammer, Inc.
Dahl & Co., G. W.
Eclipse Fuel Engg.
Fielden Inst. Div.
Fischer & Porter
Fisher Governor
Foster Engg. Co.
Foxboro Co.
General Controls
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Henszey Co.
Jo-Bell Products
Johnson Corp.
Jordan Regulator Corp.
Kieley & Mueller
Lapp Insulator
Larson Instrument
Leeds & Northrup
Leslie Co.
Lumenite Electronics
Magnetrol, Inc.
Mason-Neilan Regulator
McAlear Mfg.
McDonnell & Miller, Inc.
Mercoid Corp.
Mercon Regulator Co.
Minneapolis-Honeywell
Moore Products Co.
Natural Gas Equipment
Orchem Pump Div.



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The Republic combustion control (1) automatically maintains constant steam pressure by controlling the heat input to the boilers; (2) automatically maintains highest combustion efficiency by controlling simultaneously the fuel and air input in measured proportions; (3) automatically maintains any desired load division between the boilers; (4) automatically maintains the correct constant draft in each furnace.

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For more information circle **104** on inquiry card.

Versatrol and Simplytrol

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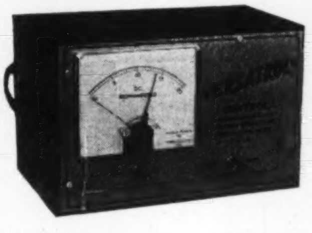


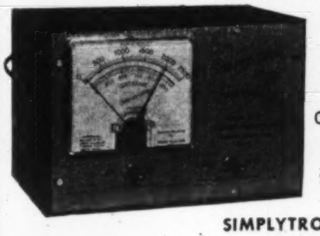
Bulletin G-7

A Complete Control Assembly

Price of unit shown **$154.25**

The Versatrol consists of a contact meter-relay and all components for a complete control. Meter-relays can be calibrated in "Feet per Minute" or "RPM" (tachometers), "Foot Candles" (photo cells), "Counts per Minute" (Radioactivity), "Deflection" (strain gages or transducers), "Deviation" (zero center)—and other functions that can be converted to electrical units. The Versatrol detects minute changes in current or voltage and actuates control relays on basis of the change. No vacuum tubes. Meter-relay system has a signal input section and power control section. Signal input may be in A.C. or D.C. Control sensitivity may range from 0.2 microamps to 1000 amps. or 0.1 mv. to over 500 volts. Shunts, series resistors and current transformers can be used in input to extend sensitivity range.

Simplytrol Controlling Pyrometers, Automatic or Limit



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Cat. No. 4531 0/2500°F.

Price: **$132.00**

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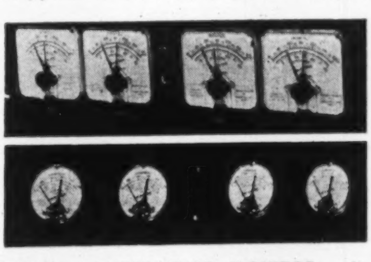
Thermocouple-actuated Automatic Pyrometer for controlling temperature in furnaces, ovens, kilns or other processes. Few moving parts—no vacuum tubes. Regular load relay is SPDT 5 Amps. Optional heavy duty relays to 40 Amps. Ten temperature ranges cover from −75° to 3000° F. Several special ranges to −400° F. "On & Off" control for gas, oil or electric heat. Indicating meter-relay is medium high resistance and has bimetal cold junction compensation. For use with all standard thermocouples. Indicating accuracy 2%. Control Accuracy depends on several factors but can be better than ½%. "Auto-Limit" switch changes unit from automatic controller to limit pyrometer for safety shutdown or warning.



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For more information circle **105** on inquiry card.

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Swartwout Co.
Taylor Inst. Cos.
Trimount Inst. Co.
U. S. Gauge Co.
Warrick Co.
Watts Regulator Co.

CONTROLLERS, AUTOMATIC, Boiler Water Concentration

Bristol Co.
Campbell Co., J. A.
Dahl & Co., G. W.
Fielden Instrument
Fischer & Porter
Foxboro Co.
General Controls
Hagan Corp.
Hammel-Dahl Co.
Henszey Co.
Industrial Instruments Inc.
Jo-Bell Products
Jordan Regulator Corp.
Leeds & Northrup Co.
Lumenite Electronics
Mason-Neilan Reg.
Milton Roy Co.
Minneapolis-Honeywell
Moore Products Co.
Orchem Pump Div.
Powers Regulator
Republic Flow Meters
Taylor Inst. Cos.

CONTROLLERS, AUTOMATIC, Bulk Material Level (See Controllers, Automatic, Granular Material Level)

CONTROLLERS, AUTOMATIC, Chlorine

Arca Regulators, Inc.
Askania Regulator Co.
Bastian-Blessing
Beckman Instruments
Brooks Rotameter
Builders-Providence
Dahl & Co., G. W.
Davis Emergency Equip.
Engelhard, Inc., Charles
Everson Mfg. Co.
Fischer & Porter
Foster Engineering
Foxboro Co.
General Controls
Hammel-Dahl Co.
Jo-Bell Products
Jordan Regulator Corp.
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Lapp Insulator
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Milton Roy Co.
Minneapolis-Honeywell
National Meter Co.
Orchem Pump Div.
Proportioneers, Inc.
Rascher & Betzold
Research Controls
Republic Flow Meters
Shallcross Controls
Taylor Inst. Co's.
Wallace & Tiernan

CONTROLLERS, AUTOMATIC, Combustion

Arca Regulators, Inc.
Askania Regulator Co.
Assembly Products
Bailey Meter Co.
Barber-Colman Co.
Beckman Inst. Co.
Bristol Co.
Brooke Eng. Co.
Burrell Corp.
Cambridge Inst. Co.
Cash Co.
Cleveland Fuel Equip.
Combustion Control Corp.
Continental-Foundry
Cutler-Hammer, Inc.
Davis Emergency Equip.
De-Tec-Tronic Corp.
Eclipse Fuel Engg.
Electronic Prod. Co.
Electronics Corp. of Am.
Ellison Draft Gage
Engelhard, Inc., Charles
Ess Instrument
Fischer & Porter
Fisher Governor
Foxboro Co.
Furst Electronics
General Controls
G E Apparatus Sales
General Regulator Corp.
Gordon Co., Claud S.
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Jo-Bell Products
Larson Instrument
Leeds & Northrup Co.
Mason-Neilan Reg. Co.
Mercoid Corp.
Mine Safety Appliances
Minneapolis-Honeywell
Moore Products Co.
National Brass Co.
Natural Gas Equipment
Partlow Corp.
Perfex Controls Div.
Controls Div.
Reliance Inst. Mfg. Corp.
Republic Flow Meters
Selas Controls Div.
Shallcross Controls
Soreng Products
Standard Instrument
Surface Combustion
Taylor Instrument Cos.
Wheelco Inst. Div.
Worner Electronics

Fielden

Simplified Instrumentation

Puts accurate, dependable instrumentation within reach of every plant . . . every process

INSTRUMENT	USE
TEKTOR Electronic Level Control	Controls any material at high or low limit. No moving parts.
TELSTOR Continuous Level Indicator	Shows level of liquids, powders, interface up to 1 mile away.
TEKTOLOG Recorder-Controller	AC or DC input signals.
NULL-BALANCE Recorder-Controller	Available as AC Wheatstone bridge or DC potentiometer for many variables.
CAPACITANCE BRIDGE Recorder-Controller	For capacitance signals.
MULTI-POINT Recorder-Controller	Up to 24, 48, even 96 points.
SCANNER Indicating or Non-Indicating	Monitors any number of points at high speed. For all types of variables.
PROXIMITY METER	Measures dimensions, product composition.
SERIES 97 Temperature Control	Electronic on-off control—resistance o impedance inputs.
SERIES 80 D.C. Amplifier	Low level in—proportional DC out.
DRIMETER Control	Moisture content of fabrics.
YARN-EVENESS Recorder	Checks yarn for uniformity of mass.
SPECIALIZED INSTRUMENTATION	For moisture measurement, tank gauging, pH, conductivity, strain gauging, etc.

Send for Bulletins

Robertshaw-Fulton®
CONTROLS COMPANY
FIELDEN INSTRUMENT DIVISION
Dept. A, 2920 N. 4th St., Phila. 33, Pa.

For more information circle **106** on inquiry card.

CONTROLLERS, AUTOMATIC, Condensation

Bailey Meter Co.
Boylston Co.
Bristol Co.
Emmett Machine
Fisher Governor Co.
General Controls
General Regulator Corp.
Hammel-Dahl Co.
Jo-Bell Products
Moore Products Co.
Powers Regulator
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Taylor Inst. Cos.
Valv-Trol Co.
Weston Elec. Inst.

CONTROLLERS, AUTOMATIC, Condenser Leakage

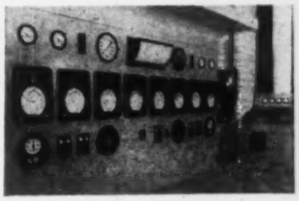
Bristol Co.
Doelcam Div.
Foxboro Co.
Kellogg Switchboard
Leeds & Northrup Co.
Warrick Co.

CONTROLLERS, AUTOMATIC, Consistency

Askania Regulator Co.
Bailey Meter Co.
Brabender Corp.
Bristol Co.
De Zurik Shower Co.
Dressen-Barnes Corp.
Electric Eye Equipment
Fischer & Porter
Foxboro Co.
General Controls
General Regulator
Hammel-Dahl Co.
Industrial Control Panel
Lumenite Electronic Co.
Mason-Neilan Regulator
Merritt Engg. & Sales
McAlear Mfg.
Northern Equip. Co.
Ohmart Corp.
Robinette Co.
Shallcross Controls
Taylor Inst. Cos.

CONTROLLERS, AUTOMATIC, Counting

Abrams Instrument
ACF Electronics Div.
Adde & Co.
Atomic Instrument
Austin Company
Automatic Elec. Sales
Automatic Temp. Control
Autotron
Avion Div.
Berkeley Scientific
Bristol Co.



BAILEY METER

Combustion CONTROL

● Bailey Meter Automatic Combustion Control of boilers results in substantial saving in fuel; increased boiler capacity; reduction of boiler and furnace maintenance; more time for operators to devote to general station maintenance; and improvement in the general character of service.

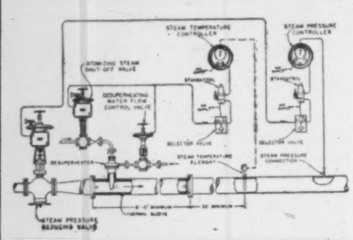
Bailey Meter Control makes possible the everyday operation of boilers at test efficiencies because it is a complete combustion control system which (1) automatically maintains steam pressure by supplying fuel and air simultaneously to boilers in accordance with changes in steam demand, (2) automatically maintains most economical fuel-air ratio by incorporating the Bailey Boiler Meter as an integral part of the system, (3) automatically maintains the desired furnace draft, and (4) automatically distributes load among boilers so that each unit carries its share.

This sturdy inexpensive air-operated control system has been applied to all sizes and types of boilers ranging from 200 h.p. upward. It is applicable to all fuels and all methods of firing.

For further information consult Sweet's Engineering Catalogs or write for bulletin Nos. 1022 & 1023.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle **107** on inquiry card.


STEAM TEMPERATURE CONTROLLER
STEAM PRESSURE CONTROLLER
ATOMIZING STEAM SHUT-OFF VALVE
DESUPERHEATING WATER FLOW CONTROL VALVE
STANDATROL
SELECTOR VALVE
DESUPERHEATER
STEAM TEMPERATURE ELEMENT
STEAM PRESSURE CONNECTION
THERMAL SLEEVE
STEAM PRESSURE REDUCING VALVE

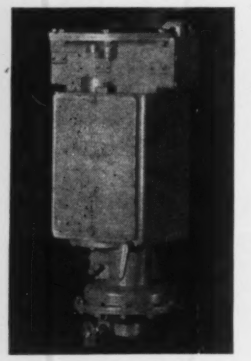
DESUPERHEATING & PRESSURE REDUCING CONTROL

● Bailey Meter Control of desuperheating and pressure reducing incorporates standard Bailey Controllers for both pressure and temperature, as well as a special Bailey Reducing Valve equipped with valve positioner and air cooled packing gland.

The control system is air-operated and is arranged to maintain the desired final steam temperature by controlling the quantity of water fed to the desuperheater. This temperature is measured by a sensitive temperature controller with the temperature element located at the outlet of the ● desuperheater.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle **108** on inquiry card.



REPUBLIC REGULATORS

Republic pneumatic or hydraulic type regulators are supplied for the automatic control of pressure, rate of flow, speed of rotation, liquid level, or the proportioning of two pressures, flows, etc., in a fixed ratio.

They measure the quantities they control regardless of the application. They can be made sensitive to changes of less than 0.002 in. of water.

WRITE FOR DATA BOOK No. S-13

REPUBLIC FLOW METERS CO.
2240 Diversey Pkwy. Chicago 47, Ill.

REPUBLIC INSTRUMENTS • CONTROLS

For more information circle **109** on inquiry card.

Brooks Rotameter Co.
Butler Mfg. Corp.
Cal-Tronics Corp.
Clevite-Brush
Coleman Engr.
Counter & Control Corp.
Detectron Co.
De-Tec-Tronic Labs.
Dittmore & Freimuth
Eagle Signal Corp.
Electronic Control Systems
Electronics Corp. of Am.
El-Tronics, Inc.
Emmett Machine & Mfg.
Engineering Res. & Dev.
Epsco, Inc.
Fischer & Porter
General Electric
Gilmore Industries
Haledy Electronics
Industrial Control Panel
Industrial Electronics
Lumenite Electric Co.
Magnetic Industries
Martin-Hubbard Corp.
Metrotype Corp.
National Time & Signal
Nuclear Chicago
Potter Instrument
Radiation Inst. Dev. Lab.
RCA
Rea Company
Rockwell Engr.
Servo Corp. of Amer.
Standard Electric Time
Streeter-Amet Co.
Taller & Cooper
Walkirt Co.
Weighing Components
Westport Electric
Wilson & Co.
Worner Electronic Devices

CONTROLLERS, AUTOMATIC, Current (See Regulators)

CONTROLLERS, AUTOMATIC, Cycle

Abrams Instrument
Adde & Co.
Askania Regulator Co.
Austin Company
Autocall Co.
Automatic Temp. Control
Bailey Meter Co.
Barber Colman
Barnes Co., W. F. & J.
Berkeley Scientific
Betts & Betts
Black, Sivalls & Bryson
Bristol Co.
Brooks Rotameter
Cal-Tronics Corp.
Cincinnati Time Recorder
Climax Div.
Control Engg. Co.
Counter & Control Corp.
Cramer Co., Inc.
Cutler-Hammer, Inc.
Denver Fire Clay
Dietz Co., Henry G.
Electric Switch Corp.
Electronic Controls
Emmett Machine
Engr. Research & Dev.
Fisher Governor
Fisher-Pierce Co.
Foxboro Co.
General Controls
G E Apparatus Sales
Gotham Instrument
Hagan Corp.
Haydon Co., A. W.
Industrial Control Panel
Industrial Timer Corp.
Industrol Corp.
International Instrument
Leeds & Northrup Co.
Lumenite Electronic
Manning, Maxwell & Moore
Martin-Hubbard Corp.
Mason-Neilan Reg. Co.
Milton Roy Co.
Minneapolis-Honeywell
National Time & Signal
Panellit, Inc.
Paragon Electric Co.
Penn Ind. Inst. Corp.
Perfex Controls Div.
Potter Instrument
Powers Regulator
Presin Co.
Rea Company
Robinette Co.
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Servo Corp. of Amer.
Sinclair-Collins
Skaneateles Mfg.
Streeter-Amet Co.
Taylor Inst. Cos.
Tork Clock
Valv-Trol Co.
Vocaline Corp.
West Instrument Corp.
Weston Elec. Inst.
Whidett Co.
Wilson & Co.

CONTROLLERS, AUTOMATIC, Damper

Acro Mfg. Co.
Air Associates
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Atwood & Morrill
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Beck Co.
Bristol Co.
Brooke Eng. Co.
Cal-Tronics Corp.
Cash Co.
Cleveland Fuel Equip.
Climax Div.
Conoflow Corp.
Cook Electric Co.
Davis Reg. Co.
Denver Fire Clay Co.
De-Tec-Tronic Corp.
Dietz Co., Henry G.
Dressen-Barnes Corp.
Electronic Prod. Co.
Fisher Governor
Foster Eng. Co.
Foxboro Corp.
Fuel Watchman
Fulton Sylphon Co.
General Controls
General Power Plant
General Regulator Corp.
Gleason-Avery, Inc.
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Johnson Service Co.
Kieley & Mueller
Larson Instrument
Leeds & Northrup Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Mercoid Corp.
Minneapolis-Honeywell
Natural Gas Equipment
Penn Ind. Inst. Corp.
Powers Regulator Co.
Preferred Utilities Mfg.
Reliance Inst. Mfg. Corp.
Republic Flow Meters
Robinette Co., W. C.
Schade Valve Mfg. Co.
Shallcross Controls
Soreng Products
Spence Eng. Co. Inc.
Standard Instrument
Summers Gyroscope
Taylor Instrument Cos.
Weston Elec. Inst.
Wheelco Inst. Div.
White-Rodgers Electric

CONTROLLERS, AUTOMATIC, Density

Acme Regulator Co.
Arca Regulators, Inc.
Askania Regulator Co.
Automatic Temp. Control
Automatic Valve Control
Bailey Meter Co.
Berkeley Scientific
Bristol Co.
Cincinnati Div.
Climax Div.
De-Tec-Tronic Corp.
Ess Instrument Co.
Fielden Inst. Div.
Fischer & Porter
Foxboro Co.
Gaydon Co.
General Controls
Hagan Corp.
Hays Corp.
Indus. Nucleonics
Instruments Inc.
Larson Instrument
Lumenite Electric Co.
Macbeth Corp.
Manning, Maxwell & Moore
Milton Roy Co.
Mine & Smelter Supply
Minneapolis-Honeywell
Moore Products
Norcross Corp.
Nuclear Research
Ohmart Corp.
Penn Ind. Inst. Corp.
Precision Thermometer
Radioactive Products
Refinery Supply Co.
Republic Flow Meters
Shallcross Controls
Standard Instrument
Taylor Instrument Cos.
Wheelco Inst. Div.
Weston Elec. Inst.

CONTROLLERS, AUTOMATIC, Desuperheat

Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Bailey Meter Co.
Bristol Co.
Continental Foundry
Foxboro Co.
General Regulator Corp.
Hagan Corp.
Hammel-Dahl Co.
Industrol Corp.
Leeds & Northrup Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Mercon Regulator Co.
Minneapolis-Honeywell
Penn Ind. Inst.
Republic Flow Meters Co.
Spence Eng. Co., Inc.
Swartwout Co.
Taylor Inst. Cos.
Trerice Co.
Weston Elec. Inst.

CONTROLLERS, AUTOMATIC, Draft

A-P Controls Corp.
Arca Regulators, Inc.
Askania Regulator Co.
Atlas Valve Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Beck Co.
Bristol Co.
Brooke Eng. Co., Inc.
Cash Co.
Cleveland Fuel Equip.
Climax Div.
Denver Fire Clay Co.
Dietz Co., Henry G.
Foster Eng. Co.
Foxboro Co.
General Controls
General Regulator Corp.
Gleason-Avery, Inc.
Hagan Corp.
Hammel Dahl Co.
Hays Corp.
Leeds & Northrup Co.
Mason-Neilan Regulator
Minneapolis-Honeywell
Moore Products Co.
National Airoil Burner
Natural Gas Equipment
Perfex Controls Div.
Preferred Utilities Mfg.
Reliance Inst. Mfg. Corp.
Republic Flow Meters
Robinette Co., W. C.
Schade Valve Mfg.
Seely Inst. Co., Inc.
Shallcross Controls
Soreng Products
Standard Instrument
Taylor Inst. Cos.
Weston Elec. Inst.

CONTROLLERS, AUTOMATIC, Feed Water

Askania Regulator Co.
Atlas Valve Co.
Atwood & Morrill
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Bar-Ray Products
Black, Sivalls & Bryson
Bristol Co.
Brooks Rotameter Co.
Builders-Providence, Inc.
B. W. Controller Corp.
Campbell Co., J. A.
Cash Co., A. W.
Cash Valve Mfg. Corp.
Climax Div.
Combustion Control
Continental Foundry
Cutler-Hammer, Inc.
Dahl & Co.
Davis Regulator
Eclipse Fuel Engg.
Fielden Inst. Div.
Fischer & Porter
Fisher Governor
Foster Engg. Co.
Foxboro Co.
General Controls
General Regulator
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Henszey Co.
Jo-Bell Products
Jordan Regulator Corp.
Kates Co., W. A.
Kieley & Mueller
Lapp Insulator
Leslie Co.
Lumenite Electronic
Magnetrol, Inc.
Mason-Neilan Reg. Co.
McAlear Mfg.
McDonnell & Miller, Inc.
Mercon Regulator Co.
Minneapolis-Honeywell
Moore Products
Natural Gas Equipment
Orchem Pump Div.
Penn Ind. Inst. Div.
Republic Flow Meters
Research Controls
Revere Corp.
Schade Valve Mfg. Co.
Simplex Valve & Meter
Spence Engg. Co., Inc.
Squires Co.
Swartwout Co.
Taylor Inst. Co.
Trimount Inst. Co.
Weston Elec. Inst.

CONTROLLERS, AUTOMATIC, Filter Rate

Bristol Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
Kates Co., W. A.
Mason-Neilan Reg. Co.
Minneapolis-Honeywell
Penn Ind. Inst. Div.
Republic Flow Meters
Simplex Valve & Meter
Taylor Inst. Cos.
Warrick Co.

CONTROLLERS, AUTOMATIC, Float

AiResearch Mfg.
Allen-Bradley Co.
Associated Valve & Engr.
Atlas Valve Co.
Atwood & Morrill
Autocall Co.
Automatic Control Co.
Automatic Temp. Control
Bailey Meter Co.
Black, Sivalls & Bryson
Bristol Co.
Builders-Providence
Campbell Co., J. A.
Clark Cooper Co.
Climax Div.
Cutler-Hammer, Inc.
Davis Regulator Co.
DeZurik Shower Co.
Fischer & Porter
Fisher Governor
Foster Engg. Co.
Foxboro Co.
Frick Co.
Fulton Sylphon Div.
Furnas Electric Co.
General Controls
GE Apparatus Sales
Grove Valve & Regulator
Hagan Corp.
Hammel-Dahl Co.
Industrial Control Panel
Instruments Corp.
Jo-Bell Products
Kates Co., W. A.
Kieley & Mueller
Klipfel Valves
Leupold & Stevens
Lumenite Co.
Magnetrol Inc.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg.
McDonnell & Miller, Inc.
Mercoid Corp.
Mercon Regulator Co.
Minneapolis-Honeywell
Moore Products
Northern Equipment
Penn Ind. Inst. Corp.
Phoenix Precision Inst.
Republic Flow Meters
Sarco Co., Inc.
Schade Valve Mfg. Co.
Shallcross Controls
Simplex Valve & Meter
Southwest Control
Spence Eng. Co., Inc.
Swartwout Co.
Taylor Inst. Cos.
Topp Industries, Inc.
Water Level Controls Co.
Weston Elec. Inst.

CONTROLLERS, AUTOMatic, Flow

Air Associates
AiResearch Mfg. Co.
American Meter Co.
A-P Controls Corp.
Arca Regulators, Inc.
Askania Regulator
Assos. Valve & Engrg.
Atomic Instr.
Automatic Temp. Control
Bailey Meter Co.
Baldwin-Lima-Hamilton
Barber-Colman Co.
Beck Co.
Black, Sivalls & Bryson
Bristol Co.
Brooke Engineering Co., Inc.
Brooks Rotameter
Builders-Providence
Cash Valve Mfg.
Clark Cooper Co.
Consolidated Engg.
Conoflow Corp.
Cook Electric
Cutler-Hammer, Inc.
Dahl & Co., G. W.
Davis Regulator
Denver Fire Clay Co.
Dressen-Barnes Corp.
DeZurik Shower Co.
Electrimatic Corp.
Fenwall, Inc.
Fielden Instrument
Fischer & Porter
Fisher Governor
Ford Regulator Valve
Foster Engg. Co.
Foxboro Co.
Fulton Sylphon Div.
General Controls
GE Apparatus Sales
General Regulator Corp.
Gilmore Industries
G. M. Mfg. Co.
Grove Valve & Regulator
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Henszey Co.
Hewson Co., Inc.
Industrial Control Panel
Industrial Engg. Corp.
Industrial Inst. Corp.
Indus. Nucleonics
Jo-Bell Products
Kates Co., W. A.
Kearfott Co., Inc.
Kieley & Mueller
Leeds & Northrup Co.
Leslie Co.
Leupold & Stevens
Lumenite Co.
Magnetrol, Inc.
Mallory & Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McDonnell & Miller, Inc.
Mercon Regulator
Milton Roy Co.
Minneapolis-Honeywell
Moog Valve
Moore Products
Newmatic Corp.
North American Mfg.
Northern Equipment
Orchem Pump Div.
Penn Ind. Inst. Div.
Permutit Co.
Phoenix Precision Inst.
Podbielniak, Inc.
Potter Aeronautical
Powers Regulator
Precision Scientific Co.
Process Controls, Inc.
Proportioneers, Inc.
Republic Flow Meters
Research Controls
Revere Corp.
Richardson Scale Co.
Robinette Co., W. C.
Rockwell Co., W. S.
Rockwell Register Corp.
R-S Prod. Corp.
Sarco Company Inc.
Schutte & Koerting
Shallcross Controls
Simplex Valve & Meter
Sparling Meter Co.
Spence Eng. Co., Inc.
Standard Instrument
Streeter-Amet Co.
Swartwout Co.
Taylor Inst. Cos.
Trimount Inst. Co.
Union Switch
Vickers Inc.
Waterman Engineering
Waukee Engineering
Weston Elec. Inst.

CONTROLLERS, AUTOMATIC, Flow Proportioning

Air Associates
AiResearch Mfg.
American Electronics Mfg.

American Meter Co.
A-P Controls Corp.
Arca Regulators, Inc.
Askania Regulator Co.
Austin Co.
Autocall Co.
Automatic Temp. Control
Bailey Meter Co.
Baldwin-Lima-Hamilton
Barber-Colman Co.
Beck Co.
Bendix Aviation Corp.
Bogue Electric Mfg. Co.
Bowser, Inc.
Bristol Co.
Brooke Eng. Co.
Brooks Rotameter
Builders-Providence
Cash Co.
Connelly, Inc.
Cutler-Hammer, Inc.
Dahl & Co., G. W.
DeZurik Shower Co.
Dressen Barnes Corp.
Electronic Prod. Co.
Fielden Instrument
Fischer & Porter
Fisher Governor
Foxboro Co.
Fulton Sylphon Co.
General Controls
General Regulator Corp.
Gilmore Industries
Gow-Mac Instrument
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Heller Co., G. K.
Henszey Co.
Industrial Control Panel
Industrial Inst. Corp.
Jordan Regulator
Kates Co., W. A.
Kearfott Co., Inc.
Lammert & Mann Co.
Lapp Insulator
Leeds & Northrup Co.
Leslie Co.
C. W. Logeman Co.
Lumenite Electronic Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg. Div.
Mercon Regulator Co.
Milton Roy Co.
Minneapolis-Honeywell
Moore Products Co.
Newmatic Corp.
Orchem Pump Div.
Penn Ind. Inst. Div.
Perfex Controls Div.
Phoenix Precision Inst.
Potter Aeronautical
Precision Scientific Co.
Proportioneers, Inc.
Reliance Inst. Mfg. Corp.
Republic Flow Meters Co.
Reynolds Gas Regulator
Richardson Scale Co.
Robinette Co.
Rockwell Co., W. S.
R-S Prod. Corp.
Schutte & Koerting
Selas Corp. of America
Shallcross Controls
Simplex Valve & Meter
Soreng Products
Sparling Meter Co.
Spence Engr. Co., Inc.
Standard Instruments
Streeter-Amet Co.
Taylor Inst. Cos.
Thayer Scale & Eng'ng
Thermco Labs.
Union Switch
Wallace & Tiernan
Waukee Engineering
Western Gear
Weston Elec. Inst.

CONTROLLERS, AUTOMATIC, Frequency (See Regulators)

CONTROLLERS, AUTOMATIC, Furnace

Acro Mfg. Co.
A-P Controls Corp.
Arca Regulators, Inc.
Askania Regulator Co.
Assembly Products
Automatic Elec. Mfg. Co.
Automatic Switch Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Barnes Co., F. W. & J.
Beck Co.
Blue M. Electric Co.
Bristol Co.
Brooke Eng. Co. Inc.
Burling Instrument Co.
Burrell Corp.
Cash Co., A. W.
Clark Controller Co.
Cleveland Fuel Equip.
Cook Electric Co.
Cutler-Hammer Inc.
Cybertronic Corp.
Dahl & Co., G. W.
Denver Fire Clay Co.
De Tec-Tronic Corp.
Dickson Co.
Doelcam Div.
Eclipse Fuel Engr.
Electronic Prod. Co.
Engelhard, Inc., Charles
Ess Instrument
Fielden Instrument
Fischer & Porter
Foxboro Co.
Fox Valley Inst.
Fuel Watchman
Fulton Sylphon Div.
General Controls
G E Apparatus Sales
General Regulator Corp.
Gleason-Avery, Inc.
Gordon Co., Claud S.
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Huppert Co., K. H.
Industrial Control Panel
Larson Instrument
Leeds & Northrup
Lindberg Air
Macdonald Co., W. S.
Marsh Corp.
Mason-Neilan Regulator
Mercoid Corp.
Minneapolis-Honeywell
National Airoil Burner
Nuclear Research
Paragon Electric
Partlow Corp.
Penn Electric Switch
Perfex Controls Div.
Pyrometer Inst. Co.
Republic Flow Meters
Robinette Co., W. C.
Rockwell Co., W. S.
R-S Prod. Corp.
Shallcross Controls
Soreng Products
Spence Engineering Co.
Taylor Inst. Cos.
Thermometer Corp.
Thwing-Albert Inst. Co.
Tork Clock
United Elec. Controls
West Instrument Corp.
Westinghouse Elec.
Weston Elec. Inst.
Wheelco Inst. Div.
White Mfg. Co.
White-Rodgers Electric
Wilgus Mfg. Co.

CONTROLLERS, AUTOMATIC, Gas Density

Askania Regulator Corp.
Bailey Meter Co.
Bristol Co.
Brooke Engrg. Co., Inc.
Cutler-Hammer, Inc.
Fischer-Porter
Gaydon Co.
General Controls
General Power Plant
Hagan Corp.
Larson Instrument
Leeds & Northrup Co.
Moore Products
Refinery Supply Co.
Shallcross Controls
Standard Inst.
Taylor Inst. Cos.
Thermco Labs.

CONTROLLERS, AUTOMATIC, Gas Mixing (See Controllers, Automatic, Flow Proportioning

CONTROLLERS, AUTOMATIC, Granular Material Level

Askania Regulator Co.
Automatic Temp. Control
Avion Div.
Baldwin-Lima-Hamilton
Bin-Dicator
Bristol Co.
Builders-Providence
Cleveland Fuel
Daytronic Corp.
Electronic Prod. Co.
Fielden Instrument
Fuller Co.
Gaydon Co.
General Controls
Gilmore Industries Inc.
Industrial Elec. Controls
Instruments Inc.
Jarco Services
Jeffrey Mfg. Co.
Lumenite Electronic Co.
Merrick Scale
Mosher Electronic
Nuclear Research
Ohmart Corp.
R-C Scientific Inst. Co.,
Richardson Scale Co.
Robinette Co., W. C.
Shallcross Controls
Synchro-Start Products,
Techniflex Corp.
United Engineers
Viking Instruments
Worner Electronic Devices

CONTROLLERS, AUTOMATIC, Granular Material Weight

Baldwin-Lima-Hamilton
Bin-Dicator Co.
Builders-Providence
Dillon & Co., W. C.
Ess Instrument
Exact Weight Scale Co.
Fielden Instruments
Gaydon Co.
General Controls
Gilmore Industries Inc.
Industrial Control Panel
Kearfott (Western)
Merrick Scale
Nuclear Research
Omega Machine
R-C Scientific Inst. Co.
Richardson Scale Co.
Rockwell Engrg.
Streeter-Amet Co.
Taylor Inst. Cos.
Thayer Scale & Engrg.
Toledo Scale Co.
Wallace & Tiernan
Weighing Components

CONTROLLERS, AUTOMATIC, Gravity

Arca Regulators, Inc.
Askania Regulator Co.
Bailey Meter Co.
Bristol Co.
Climax Div.
Ess Instrument
Fischer & Porter
Foxboro Co.
General Controls
Hagan Corp.
Hays Corp.
Lear Inc.
Leeds & Northrup Co.
Mason-Neilan Regulator
Manning, Maxwell & Moore
Milton Roy Co.
Mine & Smelter Supply
Minneapolis-Honeywell
Moore Products
Ohmart Corp.
Phoenix Precision Inst.
Precision Thermometer
Republic Flow Meters
Richardson Scale Co.
Shallcross Controls
Taylor Inst. Cos.
Weston Elec. Inst.

CONTROLLERS, AUTOMATIC, Humidity

American Inst. Co.
American Moistening Co.
Arca Regulators, Inc.
Atlas Valve Co.
Barber-Colman Co.
Brabender Corp.
Bristol Co.
Cramer & Co., Inc.
Dietert Co.
Doelcam Div.
Driaire, Inc.
Electric Eye Equipment
Electronic Engineers
Electronic Prod. Co.
Elgin-Neomatic, Inc.
Fenwal, Inc.
Fielden Inst.
Fischer & Porter
Food Technology, Inc.
Foxboro Co.
Friez Instrument
Fuel Watchman
General Controls Co.
Gotham Inst. Div.
Hallikainen Instruments
H-B Inst. Co., Inc.
Hygrotester Inc.
Illinois Testing Labs.
Instruments Corp.
Johnson Service Co.
Kahn & Co.
Leeds & Northrup Co.
Mason-Neilan Regulator
Mine Safety Appliance
Minneapolis-Honeywell
Moeller Instrument Co.
Moisture Register Co.
Norcross Laboratories
Partlow Corp.
Penn Ind. Inst. Corp.
Phen-Trols, Inc.
Phila. Thermometer Co.
Physical Research Labs
Powers Regulator Co.
R-C Scientific Inst. Co.,
Rochester Mfg. Co.
Sarco Co., Inc.
Scientific Inst. Co.
Scientific Inst. Dev. Labs.
Serdex, Inc.
Soreng Products
Surface Combustion Corp.
Taylor Inst. Cos.
Tenney Engineering
Thermo-Electric Co.
Thwing-Albert Inst. Co.
Trerice Co., H. O.
United Elec. Controls
U. S. Gauge Co.
Valverde Labs.
Varo Mfg. Co.
Weksler Thermometer
Weston Elec. Inst.
White-Rodgers Elec.
Zeiss, Inc., Carl

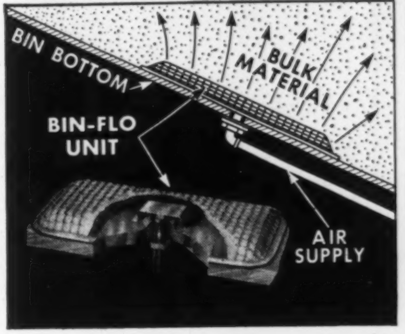
CONTROLLERS, AUTOMATIC, Lighting

Abrams Instrument
American Kloeckner-Moeller
Askania Regulator
Automatic Elec. Mfg.
Automatic Switch Co.
Avion Div.
Betts & Betts
Cutler-Hammer, Inc.
De-Tec-Tronic Labs.
Ebert Electronics
Electronic Control
Fisher-Pierce Co.
General Controls
G E Apparatus Sales
Industrial Control Panel
Lumenite Co.
Magnetic Amplifiers
Magnetic Instrument
Michigan Electronics, Inc.
Montgomery Mfg.
Paragon Electric Co.
Phoenix Precision Insts.
Rockwell Engr.
Soreng Products
Square D Co.
Superior Electric
Timely Instruments
Tork Clock
United Transformer
Vocaline Corp.
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.
Worner Electronics Devices
Zenith Electric

CONTROLLERS, AUTOMATIC, Liquid Level

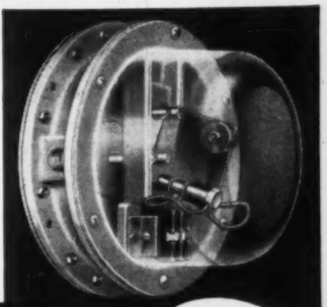
Aeromarine Inst. Co., Inc.
Alco Valve Co.
Allen-Bradley Co.
Alloy Bellows Engr.
American Electronic Mfg.
American Meter Co.
Arca Regulators, Inc.
Askania Regulator Co.
Assoc. Valve & Engrg.
Atlas Valve Co.

BIN-FLO AERATING UNIT



Provides Steady Flow of Dry, Finely Ground Materials which tend to bridge in storage. Uses only small amount low-pressure air.

BIN-DICATOR BIN LEVEL INDICATOR



For All Bulk Materials

signals change in level; automatically starts and stops filling and emptying equipment.

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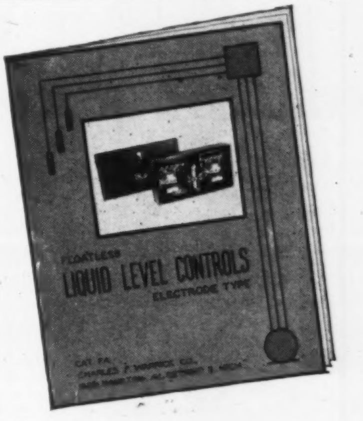

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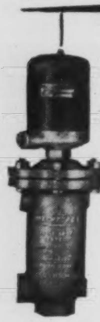
Berkley, Mich.

Warrick

FLOATLESS
LIQUID LEVEL CONTROLS
ELECTRODE TYPE

For more information circle **111** on inquiry card.

MAGNETROL



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for practically
ANY LIQUID
at any TEMPERATURE
at any PRESSURE

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- External Float Cage.

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Boylston Co.
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Continental Foundry
Control Corp.
Cook Electric
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Dahl & Co.
Davis Reg. Co.
Daytronic Corp.
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Farris Engineering
Fenwal, Inc.
Ferrara, Inc.
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Fischer & Porter
Fisher Governor Co.
Fisher-Pierce Co.
Foster Engg. Co.
Foxboro Co.
Frick Co.
Fuller Co.
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Hammel-Dahl Co.
Hays Corp.
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Industrial Elec. Controls
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Jo-Bell Products
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Johnson Service Co.
Kaye & MacDonald, Inc.

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Leslie Co.
Leupold & Stevens
Liquidepth Indicators
Lumenite Electronic
Magnetrol, Inc.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg.
McDonnell & Miller, Inc.
Mercoid Corp.
Mercon Regulator Co.
Minneapolis-Honeywell
Moore Products Co.
Natural Gas Equipment
Mosher Electronic
Norcross Corp.
NRD Instrument Co.
Nuclear Research
Ohmart Corp.
Panellit, Inc.
Penn Electric Switch
Penn Ind. Inst. Div.
Petrometer Corp.
Phoenix Precision Inst.
Powers Regulators Co.
Precision Therm.
Radioactive Products
R-C Scientific
Reliance Gauge Column
Republic Flow Meters
Research Controls
Robinette Co.
Rochester Mfg. Co.
Rockwell Engr.
R-S Products
Sarco Co., Inc.
Schade Valve Mfg. Co.
Shallcross Controls
Shand & Jurs Co.
Simplex Valve & Meter
Southwest Control
Sparling, R. W.
Spence Engineering Co.
Square D Co.
Swartwout Co.
Taylor Inst. Cos.
Technical Equipment Co.
Techniflex Corp.
Trimount Inst. Co.
Topp Industries Inc.
Uehling Instrument Co.
Union Switch
United Electric Controls
United Control Corp.
United Engineers
U. S. Gauge Co.
Vapor Recovery Sys.
Victory Engg.
Viking Instruments
Warrick Co.
Water Level Controls Co.
Weston Elec. Inst.
Worner Electronic Devices

CONTROLLERS, AUTOMATIC, Load (See Regulators)

CONTROLLERS, AUTOMATIC, Moisture (See Controllers, Automatic, Humidity)

CONTROLLERS, AUTOMATIC, pH

Askania Regulator
Assembly Products
Bailey Meter Co.
Beckman Insts.
Bristol Co.
Cybertronic Corp.
Fielden Instrument
Fisher Governor
Foxboro Co.
General Controls
G E Instrument Dept.
Lapp Insulator
Leeds & Northrup
International Instrument
Macbeth Corp.
Manning, Maxwell & Moore
Milton Roy Co.
Minneapolis-Honeywell
Process & Instruments
Research Controls
Servomechanisms, Inc.
Thwing-Albert Inst. Co.

CONTROLLERS, AUTOMATIC, Phase (See Regulators)

CONTROLLERS, AUTOMATIC, Power Factor (See Regulators)

CONTROLLERS, AUTOMATIC, Pressure & Vacuum

Acme Regulator Co.
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Allen-Bradley Co.
Alloy Bellows Engr.
American Meter Co.
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Askania Regulator Co.
Assoc. Valve & Engrg.
Atlas Valve Co.
Atwood & Morrill
Autocall Co.
Automatic Control Co.
Automatic Temp. Control
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Cash Co., A. W.
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Clark Cooper Co.
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Dickson Co.
Dietz Co., Henry G.
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Douglass Automatic
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Electronic Prod. Co.
Emerson Apparatus Co.
Emmett Machine
Farris Engineering
Fischer & Porter
Fisher Governor Co.
Foster Engg. Co.
Foxboro Co.
Fredericks Co., George
Fuel Watchman
Fulton Sylphon Div.
Furnas Electric Co.
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Gaydon Co.
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Gotham Inst. Div.
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Hallikainen Instruments
Hammel-Dahl Co.
Hass Brothers Inst. Co.
Hastings Inst.
Hawk Tool & Eng. Co.
Hays Corp.
H & H Thermostats
Hoke, Inc.
Hydraulic Controls, Inc.
Ideal Lab. Tool
Industrial Control Panel
Industrial Electronics
Industrial Engg. Corp.
Industrial Inst. Corp.
Instruments Corp.
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Kieley & Mueller
Klipfel Valves
Lammert & Mann Co.
Leeds & Northrup Co.
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Mercon Regulator Co.
Milton Roy Co.
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Moore Products
Mu-Switch Corp.
National Research Corp.
National Time & Signal
Natural Gas Equip. Inc.
Newmatic Corp.
Norden-Ketay Corp.
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Penn Ind. Inst. Div.
Perfex Controls Div.
Powers Regulator Co.
Precision Scientific
Precision Therm.
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Republic Flow Meters
Research Controls
Revere Corp.
Reynolds Gas Regulator
Robinette Co., W. C.
Rochester Mfg.
Rockwell Co., W. S.
Rockwell Engr.
Sarco Company Inc.
Schade Valve Mfg. Co.
Schwien Eng. Co.
Scientific Inst. Co.
Scientific Development
Selas Co.
Seely Instrument Co.
Servonic Insts., Inc.
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Sinclair-Collins Valve
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Stratos Div.
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Technical Equipment Co.
Tenney Engineering Co.
Todd Scientific Co.
Trerice Co., H. O.
Trimount Inst. Co.
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U. S. Gauge Co.
Uehling Instrument Co.
Valv-Trol Co.
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Vickers Inc.
Viking Instruments
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Ward Leonard Elec. Co.
Water Level Controls Co.
Weighing Components
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Weston Elec. Inst.
White-Rodgers Electric
Wiancko Engineering
Yellow Springs Inst.

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Am. Gas Furnace Co.
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Bailey Meter Co.
Barber-Colman Co.
Blue M Electric
Bristol Co.
Burling Inst. Co.
Carlingo Commodities
Cybertronic Corp.
Dickson Co.
Doelcam Div.
Eclipse Fuel Engr. Co.
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Electronic Prod. Co.
Elgin-Neomatic, Inc.
Engelhard, Chas.
Farris-Stacon
Ferner Co.
Fielden Instrument
Foxboro Co.
Fox Valley Inst.
Fuel Watchman
G E Apparatus Sales
G-M Labs
Gordon Co., Claud S.
Hallikainen Instruments
Huppert Co., K. H.
Industrial Control Panel
Illinois Testing Labs.
Klipfel Valve Div.
Leeds & Northrup Co.
Lewis-Engg. Co.
Loudon Insts. Div.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Minneapolis-Honeywell
Partlow Corp.
Perfex Corp.
Phen-Trols, Inc.
Phoenix Precision Inst.
Precision Thermometer
Pyrometer Instrument Co.
Pyrometer Service Co.
Revere Corp.
Robinette Co., W. C.
Rochester Mfg. Co.
Rockwell Eng. Co.
Scientific Glass App.
Servo Corp. of America
Squires Co.
Taylor Inst. Cos.
Thermo-Electric Co.
Thermo Electric Mfg. Co.
Thermometer Corp.
Thwing-Albert Instrument
Trerice Co., H. O.
Uehling Instrument Co.
Victory Engr.
West Instrument
Weston Elec. Inst.
Wheelco Inst. Div.

CONTROLLERS, AUTOMATIC, Radio Remote

ACF Electronics
American Electroneering
Amglo Corp.
Authorized Mfrs. Serv.
Automatic Elec. Chicago
Berkeley Scientific
Bristol Co.
Cal-Tronics Corp.
Canoga Corp.
Cardwell Mfg. Co.
C.G.S. Labs.
Collins Radio Co.
Daystrom Inst.
Electronic Control Systems
El-Tronics, Inc.
Farnsworth Electronics
Guardian Elec. Mfg. Co.
Hastings Inst. Co.
Jacobs Instruments
Kaar Eng'ng Co.
Lear Inc.
Lenkurt Electric
Librascope
Luminite Electronic
Manning, Maxwell & Moore
McFarlin Co.
Metron Instrument
Pacific Div.
Penn Ind. Inst. Corp.
Polarad Electronics
Radio Frequency Labs.
Radio Receptor Co.
RCA Div.
Rea Company
Reeves Instrument
Schwien Engg. Co.
Servo Corp. of America
Shasta Div.
Sorensen & Co.
Stewart Mfg. Co.
Summers Gyroscope
Thordarson-Meissner
Topp Industries Inc.
Virginia Electronics
Wallace & Tiernan
Yardeny Engineering Co.

CONTROLLERS, AUTOMATIC, Rate-Volume (See Controllers, Automatic, Flow)

CONTROLLERS, AUTOMATIC, Ratio

Ahrendt Instrument
Askania Regulator
Bailey Meter Co.
Bristol Co.
Brooks Rotameter Co.
Builders-Providence, Inc.
Cal-Tronics Corp.
Fischer & Porter

Foxboro Co.
G E Apparatus Sales
General Regulator
Gordon Co., C. S.
Hagan Corp.
Hays Corp.
Industrial Control Panel
Industrial Electronics
Kates Co., W. A.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Metrotype Corp.
Milton Roy Co.
Minneapolis-Honeywell
Moore Products Co.
Penn Ind. Inst. Div.
Phoenix Precision Inst.
Potter Aeronautical
Powers Regulator Co.
Proportioneers, Inc.
Reliance Inst. Mfg. Corp.
Republic Flow Meters
Research Control Inst. Co.
Servo-Tek Products
Shallcross Controls
Swartwout Co.
Taylor Inst. Cos.
Waukee Engineering
Weighing Components
Weston Elec. Inst.

CONTROLLERS, AUTOMATIC, Refrigeration

AiResearch Mfg.
Alco Valve Co.
Allen-Bradley Co.
American Kloeckner-Moeller
A-P Control Corp.
Automatic Elec. Mfg.
Automatic Temp. Control
Bristol Co.
Burling Instrument Co.
Cash Co., A. W.
Cutler-Hammer, Inc.
Dickson Co.
Electrimatic Corp.
Flow Controls, Inc.
Foxboro Co.
Frick Co.
Friez Instrument Div.
Fulton Sylphon Co.
General Controls Co.
G E Instrument Dept.
Hammel-Dahl Co.
Haydon Mfg. Co.
Industrial Control Panel
Jo-Bell Products
Lumenite Elec. Co.
Magnetrol, Inc.
Marsh Corp., Jas. P.
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercoid Corp.
Minneapolis-Honeywell
Partlow Corp.
Penn Electric Switch
Phila. Thermometer Co.
Powers Regulator Co.
Ranco, Inc.
Sarco Co., Inc.
Schade Valve Mfg. Co.
Skaneateles Mfg.
Taylor Inst. Cos.
Thermometer Corp.
United Elec. Controls
Weston Elec. Inst.
White-Rodgers Electric

CONTROLLERS, AUTOMATIC, RKVA (See Regulators)

CONTROLLERS, AUTOMATIC, Specific Gravity (See Controllers, Automatic, Gravity)

CONTROLLERS, AUTOMATIC, Speed (See Tachometric below)

CONTROLLERS, AUTOMATIC, Stoker (See Controllers, Automatic, Furnace)

CONTROLLERS, AUTOMATIC, Strain-Rate & Stress-Rate

American Electronic Mfg.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Barber-Colman Co.
Berkeley Scientific
Bristol Co.
Clevite-Brush
Fielden Instrument
Gilmore Industries
Hathaway Inst. Co.
Industrial Electronics
Phoenix Precision Inst.
Robertshaw-Fulton Co.
Thwing-Albert Instrument
Weighing Components

CONTROLLERS, AUTOMATIC, Synchronizing (See Regulators)

CONTROLLERS, AUTOMATIC, Tachometric

Abrams Instrument
Allen-Bradley Co.
Askania Regulator Co.
Assembly Products
Atomic Instrument
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Barbour Stockwell Co.
Berkeley Scientific
Bristol Co.
Burlington Inst. Co.
Cal-Tronics Corp.
Clark Controller Co.
Control Engg. Co.
Cutler-Hammer, Inc.
Cyclohm Div.
Dickson Co.
Doelcam Div.
Edison, Inc., Thomas A.
Electric Regulator Co.
Electric Tachometer
Engineering Res. & Dev.
Farris Pickering Gov.
Fielden Instrument
Flight Research Inc.
Foxboro Co.
G E Instrument Dept.
General Radio Co.
General Regulator Corp.
Hagan Corp.
Hays Corp.
Heller Co., G. K.
Hormell Instruments Co.
Industrial Controls Co.
Industrial Gauges Corp.
Jones Motorola Corp.
Kahn & Co.
Kearfott Co.
Krohn-Hite Inst.
Leeds & Northrup
Lewis & Co., J. B.
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Magnetic Instrument
Manning, Maxwell & Moore
Mason-Neilan Regulator
Maxson Corp.
Metron Instrument
Minneapolis-Honeywell
Moisture Register Co.
Nankervis Co., G. L.
Potter Aeronautical
Potter Instrument
Rea Company
Republic Flow Meters
Revco Inc.
Robertshaw-Fulton Co.
Robinette Co., W. C.
Rockwell Engg.
Servo Corp. of America
Servomechanisms
Servo-Tek Products
Servospeed Div.
Shallcross Controls
Sunshine Scientific
Taylor Inst. Cos.
Varo Mfg. Co.
Vectron, Inc.
Viking Instruments
Ward Leonard
Westinghouse Elec.
Weksler Thermometer
Wheelco Inst. Div.

CONTROLLERS, AUTOMATIC, Temperature (See Pyrometric above or Thermometric below)

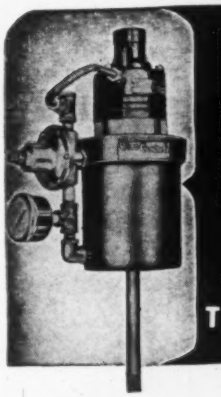
CONTROLLERS, AUTOMATIC, Temperature-Time (See Controllers, Automatic Thermometric; Thermostatic; and Time)

CONTROLLERS, AUTOMATIC, Thermometric

AiResearch Mfg.
American Inst. Co.
Amer. Temp. Indicating
Assembly Products
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Blue M Electric
Braun Corp.
Bristol Co.
Burling Inst. Co.
Cannon Instrument Co.
Cash Co.
Century Inst. Co.
Clark-Cooper Co.
Clifford Mfg. Co.
Commercial Research
Cuthbert Co., Inc.
Dickson Co.
Doelcam Div.
Douglass Automatic
Ebert Electronics
Edison Inc., Thomas A.
Electo-Tech. Equip.
Electrimatic Corp.
Electro Medical Lab.
Elgin-Neomatic, Inc.
Emerson Apparatus Co.
Emmett Machine
Farris-Stacon
Fenwal, Inc.
Fielden Instrument
Fisher Governor
Fish-Schurman Co.
Foster Engg. Co.
Foxboro Co.
Fuel Watchman
Fulton-Sylphon Div.
General Controls
G E Instrument Dept.
General Regulator Corp.
Gordan Co., Claud S.
Gotham Inst. Div.
Hagan Corp.
Hallikainen Instruments
H-B Inst. Co., Inc.
Illinois Testing Labs.
Kaye & MacDonald, Inc.
Kessler Co.
Leeds & Northrup
Leslie Co.
Magnetic Instrument
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Reg. Co.
McAlear Mfg. Co.
Minneapolis-Honeywell
Moeller Instrument Co.
Moisture Register Co.
Moore Products
Olympic Dev. Co.
Parks-Cramer Co.
Partlow Corp.
Penn Ind. Inst. Div.
Phen-Trols Inc.
Powers Regulator
Precision Scientific
Precision Therm.
Pyrometer Inst. Co.
Refinery Supply Co.
Republic Flow Meters
Revere Corp.
Research Controls
Robertshaw-Fulton Co.
Robinette Co., W. C.
Rochester Mfg. Co.
Rubicon Co.
Scientific Development
Scientific Inst. Co.
Spence Engineering Co.
Squires Co.
Stevens Mfg. Co.
Swieco Inc.
Taylor Inst. Cos.
Technical Equipment Co.
Tensitron, Inc.
Thermo-Electric
Thwing-Albert Inst. Co.
Trerice Co.
United Elec. Controls
United Optical Mfg.
Valverde Labs.
Victory Engr.
Weksler Thermometer
West Instrument Corp.
Wheelco Inst. Div.

CONTROLLERS, AUTOMATIC, Thermostatic

Accuracy Scientific Inst.
Acro Mfg. Co.
AiResearch Mfg.
Allen-Bradley Co.
Alloy Bellows Engr.
American Inst. Co.
A P Control Corp.
Askania Regulator Co.
Atlas Valve Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman Co.
Bar-Ray Products
Betts & Betts
Blue M Electric
Boekel & Co.
Bristol Co.
Boiler Room Equip.
Burling Inst. Co.
Century Inst. Co.
Cook Electric Co.
Cramer & Co., Inc.
Cutler-Hammer Inc.
Dickson Co.
Doelcam Div.
Douglass Automatic
Edison Electrical Controls
Electric Hotpack Co.
Emmett Machine & Mfg.
Farris Stacon
Fenwal, Inc.
Fielden Instrument
Fisher-Governor
Fish-Schurman Co.
Foster Eng. Co.
Foxboro Co.
Fuel Watchman
Fulton Sylphon Div.
General Controls Co.
G E Apparatus Sales
Gleason Avery, Inc.



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The New B-50 Series of pneumatic cylinders for throttling control service operate on air pressures up to 100 psig and are capable of repositioning accuracies of 1/500 part of total stem travel. Simplified one-piece piston construction features graphite impregnated "O" ring seals and a piston positioner integrally mounted in the head plate. Extra sensitive, speedy and stable—because of minimum friction and precisioned aluminum design.

Many applications include positioning electrical components, variable speed drives, rubber pinch valves, etc. Available in 4", 6" and 8" diameters with 3" and 4" stem travels. Furnished complete with cushion-loading regulator and gauge, fully piped, ready for installation.

Write for bulletin B-50

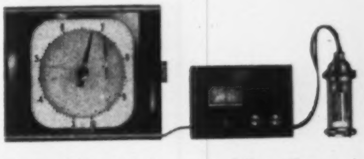
CONOFLOW CORPORATION
2100 Arch St., Phila. 3, Pa.

Cono Controls

For more information circle **114** on inquiry card.

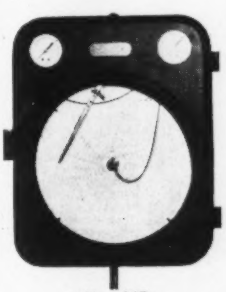
pH Automatic Controllers and Recorders

Bristol makes a very wide variety of pH Automatic Controllers and Recorders in round- and strip-chart models. The application of pH instruments in industry was pioneered by Bristol nearly 20 years ago. Thousands of Bristol pH Controllers and recorders are in use today in almost every industry. They are known for their high accuracy and rugged construction. Complete information on models offered and method of application is given in 36-page bulletin Q1304. Write for copy.



BRISTOL COMPANY 112 Bristol Rd., Waterbury 20, Conn.

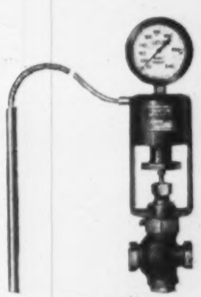
For more information circle **115** on inquiry card.



No. 90R
Air-Operated

WANT CONTROL for Water Heaters, Process or Plating Tanks?

Whether it be a simple Self-operated Regulator, or an Air Operated Controller with Diaphragm Valve, there is a CENTURY instrument to give you close control and years of dependable service.



No. 3070
Self-Operated

CALL

CENTURY INSTRUMENT COMPANY
565 E. MILWAUKEE AVE. DETROIT 2, MICHIGAN

For more information circle **116** on inquiry card.

What's YOUR Heating or Air Conditioning Control Problem?

AUTOMATIC CONTROL SYSTEM POWERS FOR AIR CONDITIONING
POWERS

. . . with their 60 years of experience installing pneumatic systems of temperature and humidity control in all types of important buildings are well qualified to help you obtain the greatest return from an investment in —

ACCURATE UNIFORM CONTROL

in all types of heated or air conditioned spaces—offices, factories, process rooms, processes, research and test laboratories, packaging or storage rooms.

Precision Control for Processes—Wherever product uniformity and quality are dependent upon precise temperature and humidity regulation use Powers controlling, indicating or recording instruments.

Increased Efficiency and Output of Workers by keeping each room or department at its proper temperature.

Cuts Heating Costs up to 25%—23% fuel savings reported by E. R. Squibb & Sons. With today's higher fuel costs bigger savings than ever before are possible with Powers control. It eliminates fuel wasted by OVER-heating with manual operation.

Phone or Write Powers Nearest Office for aid in selecting the type of automatic control that will give best results for your requirements. There's no obligation. Powers control systems can be installed in existing as well as new buildings.

Some Prominent Users of Powers Control:

Ford Motor Co.
Chrysler Corp.
Esso Research Center
Sears Roebuck & Co.
Bendix Aviation Corp.
Goodrich Tire & Rubber Co.
Eastman Kodak Co.
Pepperell Mfg. Co.
Armour & Co. • Swift & Co.
Bachmann Uxbridge Corp.
Monsanto Chemical Co.
U. S. Capitol Bldg.
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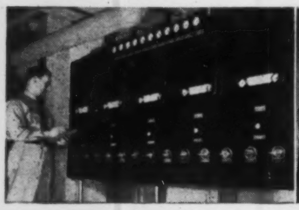

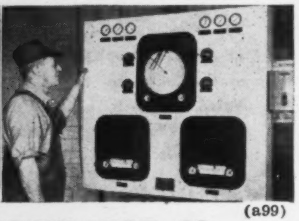

(a99)

THE POWERS REGULATOR CO.

Skokie, Ill. • Offices in Over 50 Cities, see your phone book.

OVER 60 YEARS OF TEMPERATURE AND HUMIDITY CONTROL

For more information circle **117** on inquiry card.

Gotham Inst. Co.
G-V Controls Inc.
Hagan Corp.
Hammel-Dahl Co.
H-B Inst. Co.
H & H Thermostats
Hart Mfg. Co.
Industrial Engr. Corp.
Instrument Rep. & Mfg.
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Jordan Regulator
Keckley Co., O. C.
Kieley & Mueller
Klipfel Valve Div.
Leslie Co.
Manning, Maxwell & Moore
Marsh Corp.
Mercoid Corp.
Minneapolis-Honeywell
Moisture Register Co.
Mu-Switch Corp.
Partlow Corp.
Perfex Controls Div.
Phila. Thermometer Co.
Powers Regulator Co.
Precision Scientific
Precison Therm.
Preferred Utilities
Rascher & Betzold
Republic Flow Meters
Robinette Co., W. C.
Sarco Co., Inc.
Security Valve Corp.
Smith Control & Inst.
Soreng Products
Spence Engineering Co.
Sterling Inc.
Stevens Mfg. Co.
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Swartwout Co.
Taylor Inst. Co.
Thermometer Corp.
Trerice Co.
Ulanet Co., Geo.
United Control Corp.
United Elec. Controls
Valverde Labs.
Victory Engr.
Viking Instruments
West Instrument Corp.
Weston Elec. Inst. Corp.
White Mfg. Co.
White-Rodgers Elec. Co.

CONTROLLERS, AUTOMATIC, Time

Abrams Instrument
Allen-Bradley Co.
American Electronic Mfs.
Am. Gas Accumulator
American Timer Corp.
Amglo Corp.
Automatic Elec. Mfg. Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Betts & Betts
Black, Sivalls & Bryson
Bristol Co.
Cal-Tronics Corp.
Cincinnati Time Rec.
Clare & Co.
Controls, Inc.
Counter & Control Corp.
Cramer Co., Inc.
Cutler-Hammer, Inc.
Dahl & Co., G. W.
Daystrom Inst.
De-Tec-Tronic Corp.
Dietz, Co., G. W.
Eagle Signal Corp.
Edison Elec. Prods.
Electric Hotpack Co.
Electric Switch Corp.
Electronic Controls
Electro-Physics Co.
Elgin-Neomatic, Inc.
Emmett Machine
Ferrara, Inc.
Fielden Instrument
Fisher Governor
Foxboro Co.
Fredericks Co., Geo.
Friez Instrument Div.
Fuel Watchman
General Control (Mass.)
G E Apparatus Sales
Gotham Inst. Div.
Guardian Electric Mfg.
G V Controls Inc.
Hagan Corp.
Haledy Electronic Co.
Hallikainen Instruments
Haydon Co., A. W.
Haydon Mfg. Co.
Industrial Control Panel
Industrial Timer Corp.
International Bus. Mach.
International Instrument
International Register
Johnson Service Co.
Leeds & Northrup
Lumenite Electronic
Mason-Neilan Regulator
Miller-Harris Inst. Co.
Minneapolis-Honeywell
Montgomery Mfg.
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Newmatic Corp.
Northwestern Clock Co.
Paragon Electric Co.
Partlow Corp.
Perfex Controls Div.
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Potter Instrument
Powers Regulator Co.
Pratt & Whitney
Production Instrument
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Seely Inst., Co., Inc.
Sinclair Collins Valve
Soreng Products
Standard Elec. Time
Stoelting Co., C. H.
Stromberg Time Corp.
Struthers-Dunn
Taylor Inst. Co.
Telechron, Inc.
Thomas Clock Co., Seth
Thordarson Elec. Mfg.
Tork Clock Co.
Vocaline Corp.
Walkirt Co.
Walser Automatic Timer
Ward Leonard
West Instrument Corp.
Weston Elec. Inst.
Wheelco Inst. Div.
White-Rodgers Elec.
Wilson & Co., G. C.
Yellow Springs Inst.
Zenith Electric

CONTROLLERS, AUTOMATIC, Torque

Aero Electronics
Ahrendt Instrument
Alloy Bellows Engr.
Askania-Regulator
Automatic Temp. Control
Avion Div.
Baldwin-Lima-Hamilton
Cal-Tronics Corp.
Clark Mfg. Co.
Collins Radio
Control Engg. Co.
Cutler-Hammer Inc.
Daytronic Corp.
Electronic Control
Fielden Instrument
G E Apparatus Sales
Gilmore Industries
Hagan Corp.
Heller Co., G. K.
Industrial Electronics
Industrial Engg. Corp.
Jo-Line Tools
Lear Inc.
Magnetic Amplifiers
Magnetic Instrument
Mercoid Corp.
Rea Company
Revco Inc.
Robinette Co., W. C.
Servospeed Div.
Servo-Tek Products
Taylor Inst. Cos.
Vectron, Inc.

CONTROLLERS, AUTOMATIC, Valve (See Valve-operating Devices)

CONTROLLERS, AUTOMATIC, Vacuum (See Controllers, Automatic, Pressure)

CONTROLLERS, AUTOMATIC, Viscosity

Askania Regulator Co.
Automatic Temp. Control
Bailey Meter Co.
Bendix Aviation Corp.
Berkeley Scientific
Brabender Corp.
Bristol Co.
Brookfield Engg. Labs.
Cincinnati Div.
Doelcam Div.
Drage Products
Electric Eye Equip.
Fischer & Porter
Foxboro Co.
General Controls
General Elec. Co.
Hallikainen Instruments
Norcross Corp.
Perfex Corp.
Robinette Co.
Scientific Inst. Co.
Taylor Inst. Cos.
Ultrasonic Eng'ng Co.
Visco-Meter Corp.

CONTROLLERS, AUTOMATIC, Voltage (See Regulators)

CONTROLLERS, AUTOMATIC, Volume (See Controllers, Automatic, Flow)

CONTROLLERS, AUTOMATIC, Water Level (See Controllers, Automatic, Liquid Level)

CONTROLLERS, MANUAL (Non-automatic), Field

Allis-Chalmers
Automatic Elec. Mfg.
Betts & Betts
Black, Sivalls & Bryson,
Bristol Co.
Clark Controller Co.
Climax Div.
Cutler-Hammer, Inc.
Dahl & Co., G. W.
Dormitzer Elec. & Mfg. Co.
Fischer & Porter
General Controls
G E Apparatus Sales
Kieley & Mueller
MagElec. Prod.
Magnetic Instrument
Manning, Maxwell & Moore
National Elec. Controller
Ohmite Mfg. Co.
Square D Co.
Superdraulic Corp.
Swartwout Co.
Taylor Inst. Cos.
Ward Leonard Elec. Co.
Westinghouse Elec.

CONTROLLERS MANUAL (Non-automatic), Hydraulic

Adel Precision Prods.
Askania Regulator
Autoclave Engrs.
Barksdale Valves
Bristol Co.
Brooks Rotameter
Cash Co., A. W.
Dahl & Co., G. W.
Denison Engineering
General Controls
General Regulator
Hagan Corp.
Hammel-Dahl Co.
Hydraulic Controls
Milton Roy Co.
Minneapolis-Honeywell
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Shallcross Controls
Superdraulic Corp.
Vickers Inc.

CONTROLLERS, MANUAL (Non-automatic) Motor

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Allis-Chalmers
American Kloeckner-Moeller
Automatic Elec. Mfg.
Betts & Betts
Bristol Co.
Cardwell Mfg. Corp.
Clark Controller Co.
Cutler-Hammer, Inc.
Electronic & Engg. Serv.
E-T-A Products
Fisher-Governor
Furnas Electric Co.
General Controls
G E Apparatus Sales
Heller Co., G. K.
Lapp Insulator
Leeds & Northrup
Lindberg Air
Mag Elec. Prod.
Minneapolis-Honeywell
National Elec. Controller
Ohmite Mfg. Co.
Opad Electric
Raytheon Mfg. Co.
Revco Inc.
Servospeed Div.
Shallcross Controls
Square D Co.
Superior Electric Co.
Topp Industries Inc.
Trimount Inst. Co.
Ward Leonard Elec. Co.
Westinghouse Elec.
Wilson & Co.

CONTROLLERS, MANUAL, (Non-automatic) Pneumatic

AiResearch Mfg.
Bailey Meter Co.
Barksdale Valves
Black, Sivalls & Bryson
Bristol Co.
Climax Div.
Cutler-Hammer Inc.
Fischer & Porter
General Controls
General Regulator
Hagan Corp.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Minneapolis-Honeywell
Moore Products Co.
National Pneumatic
Panellit, Inc.
Penn Ind. Inst. Corp.
Powers Regulator Co.
Research Control Inst.
Ross Operating Valve
Shand & Jurs Co.
Swartwout Co.
Taylor Inst. Cos.

CONTROLLERS, MANUAL, (Non-automatic) Rheostatic

Allen-Bradley Co.
Beck Bros.
Bristol Co.
Centralab Div.
Clark Controller Co.
Electronic & Engg. Serv.
General Controls
General Radio Co.
G E Apparatus Sales
General Regulator
Heller Co.; G. K.
Mallory & Co.
National Elec. Controller
Ohmite Mfg. Co.
Rubicon Co.
United Optical Mfg.
Ward Leonard Elec. Co.
Westinghouse Elec.

CONTROLS, AUTOMATIC (See Controllers, Automatic)

CONTROLS, Remote, Flexible

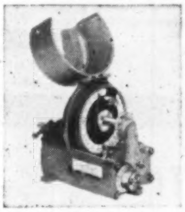
AiResearch Mfg.
Arens Controls Inc.
Arma Corp.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Barber-Colman Co.
Barbour-Stockwell
Breeze Corporations
Cal-Tronics Corp.
Control Corp.
Cutler-Hammer, Inc.
Dittmore & Freimuth
Doelcam Div.
Ebert Electronics
Feedback Controls
Femco, Inc.
Ford Instruments
F.R. Machine Works
Fulton Sylphon Div.
G E Apparatus Sales
Gilmore Industries
Hammarlund Mfg.
Industrial Control Co.
Jordan Regulator
Larson Instrument
Ledeen Mfg.
Magnetic Amplifiers
Magnetic Industries
Magnetic Instruments

CIRCUIT CONTROLLING COUNTERS *with* Automatic Reset

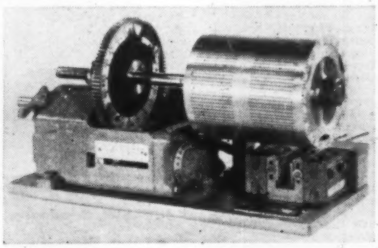
FOR REVOLUTION, STROKE AND ELECTRIC COUNTING

THESE predetermining counters with instantaneous reset will automatically recycle a variety of single and multi-stage switch functions. Recycling operates without time lag at speeds to 5,000 rpm. The switching pattern repeats automatically as long as desired. The control circuit is an integral part of the equipment.

CYCLO-MONITORS



Used to control one or two switching events within a preset count-cycle. Replace unwieldy change gears, cam systems, timing chains, etc.—provide quick and completely flexible adjustment for changing requirements. Adjustment in one-count increments extends over a wide range of numbers. Available in a variety of models—*write for General Catalog of Cyclo-Monitors.*



PROGRAMONITORS

Same cycle range as Cyclo-Monitors, but also permit ANY NUMBER of intermediate switching events. Complex switching patterns of any countable sequence can be programmed and automatically repeated. Momentary or dwell switching—continuous or intermittent operation. Built-in control circuit can be opened or closed at any numbers. *Write for Bulletin 505.*

COUNTER AND CONTROL
CORPORATION

5230 W. Electric Ave.
MILWAUKEE 14, WIS.

For more information circle **118** on inquiry card.

Manning, Maxwell & Moore
Mercoid Corp.
Minneapolis-Honeywell
Olympic Dev. Co.
Partlow Corp.
Perfex Controls Div.
Photoswitch Div.
Republic Flow Meters
Rockwell Co., W. S.
Stewart Mfg. Co.
Streeter-Amet Corp.
Superdraulic Corp.
Swartwout Co.
Taylor Inst. Cos.
Teleflex Inc.
Thermometer Corp.
Union Switch
Weatherhead Co.
Weston Elec. Inst.
Zenith Electric

CONVERTERS, Analog-to-Digital

Aero Electronics
Austin Company
Bendix Pacific Div.
Berkeley Scientific
Coleman Eng'ng Co.
Computer Insts. Corp.
Electro Instruments
Franklin Electronics
Genisco Inc.
Giannini & Co.
Hanson-Gorrill-Brian
Inst. Dev. Labs.
Jackson Co., Byron
Metrotype Corp.
Rea Co. Inc., J. B.
Taller & Cooper Inc.
Telecomputing Corp.
Ultrasonic Corp.
Westronics, Inc.

CONVERTERS, Binary to Decimal (See Decimal Converters)

CONVERTERS, Punched Card

Ahrendt Instrument Co.
Austin Company
Berkeley Scientific
Epsco, Inc.
Genisco Inc.
Kleinschmidt, Inc.
Moseley Co.
North American Inst.
Taller & Cooper Inc.
Telecomputing Corp.
Ultrasonic Corp.

CONVERTERS, Punched Tape

Ahrendt Instrument Co.
Austin Company
Berkeley Scientific
Commercial Controls Corp.
Corbett Science Labs.
Epsco, Inc.
Fish-Schurman Corp.
Moseley Co.
Remington Rand
Taller & Cooper Inc.
Telecomputing Corp.
Ultrasonic Corp.

COUNTERS, Alarm

Adde & Co.
Anatron Engg.
Automatic Temp. Control
Cal-Tronics Corp.
Clevite-Brush
Counter & Control Corp.
Cook Electric
De-Tec-Tronic Corp.
Durant Mfg. Co.
Electrical Develop.
Electrical & Phys. Inst.
El-Tronics, Inc.
Flett Laboratory
Gaydon Co.
General Electric Co.
Lumenite Electronic Co.
Martin-Hubbard Corp.
Mercoid Corp.
Metrotype Corp.
Nuclear Research
Potter Instrument
Production Instrument
Radiation Inst. Dev. Lab.
Rowe Engineering
Streeter-Amet Co.
Veeder-Root

COUNTERS, Batch, Automatic

Adde & Co.
Anatron Engg.
Atomic Instrument
Automatic Temp. Control
Berkeley Scientific Div.
Cal-Tronics Corp.
Control Devices, Inc.
Counter & Control Corp.
Detectron Co.
Durant Mfg.
Eagle Signal
Electrical Develop.
Endevco, Inc.
Engr. Research
Fischer & Porter
Genisco, Inc.
Hetherington, Inc.
I-L-S Instrument
Industrial Electronics, Inc.
Metrotype Corp.
Nucleonic Corp
Penn Ind. Inst. Corp.
Post Machinery
Potter Aeronautical
Potter Instrument
Presin Co.
Production Instrument
R-C Scientific Inst.
Richardson Scale
Special Instruments Lab.
Spellman Television
Standard Elec. Time
Streeter-Amet Co.
Telechron Dept.
Weighing Components
Westport Electric
Wilson & Co., G. C.

COUNTERS, Colony

American Optical
Central Scientific
Fisher Scientific Co.
Fish-Schurman Corp.
Sargent & Co.
Thomas Co., Arthur H.

COUNTERS, Cycle

Adde & Co.
Aero Instrument Co.
American Time Prods.
Atomic Instrument
Automatic Elec. Chicago
Automatic Temp. Control
Berkeley Scientific
Bristol Co.
Brush Electronics
Burroughs Corp.
Cal-Tronics Corp.
Control Engineering
Cook Electric
Counter & Control Corp.
Cyclotron Specialties Co.
Detectron Co.
Dittmore & Freimuth
Electric Speed Indicator
Engineering Res. Assoc.
Foxboro Co.
General Elec. Co.
Gordon Enterprises
Gorrell & Gorrell
Haydon Co., A. W.
Hetherington, Inc.
Hewlett-Packard Co.
Industrial Elec. Controls
Lumenite Electronics
Martin-Hubbard Corp.
Minnesota Electronics
Paragon Electric Co.
Penn Ind. Inst. Corp.
Potter Instrument
Presin Co.
Raytheon Mfg. Co.
Richardson Scale
Standard Elec. Time Co.
States Co.
Stoelting Co., C. H.
Streeter-Amet Co
Sunshine Scientific
Telechron Dept.
Thodarson-Meissner
Veeder-Root, Inc.
Walkirt Co.
Westinghouse Elec.

COUNTERS, Electrical

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Aero Instrument Co.
American Electroneering
American Electronic Labs.
Anatron Engg.
Atomic Instrument
Automatic Elec. Chicago
Automatic Temp. Control
Bill Jack Scientific
Bristol Co.
Butler Mfg. Corp.
Cal-Tronics Corp.
Cambridge Thermionic
Coleman Engr.
Control Engineering
Corbett Science Labs.
Counter & Control Corp.
Cyclotron Specialties
Dittmore & Freimuth
Durant Co.
Eagle Signal
Electrical & Physical Inst.
Electronic Control Sys.,
El-Tronics, Inc.
Emmett Machine
Engineering Res. Assoc.
Engr. Research & Dev.
General Elec. Co.
Genisco, Inc.
Guardian Electric
Hagen Mfg. Co.
Haledy Electronic
Haydon Co., H. W.
Industrial Electronics
International Std. Trad.
Jessup Engr. & Dev.
Kearfott Co., Inc.
Landis & Gyr., Inc.
Maxson Instruments
Metrotype Corp.
Mueller Laboratory
Nemeth Labs., Inc.
Photocon Research
Potter Instrument
Presin Co.
Production Instrument
Raycon Corp.
Richardson Scale Co.
Sangamo Electric
Streeter-Amet Co.
Sunshine Scientific
Thordarson-Meissner
Unimax Switch
Veeder-Root, Inc.
Walkirt Co.
Wang Laboratories
Wiancko Engineering

COUNTERS, Electronic

Abrams Instrument
ACF Electronics Div.
Advance Electronics
American Electroneering
American Electronics Labs.
Atomic Instrument
Austin Company
Automatic Temp. Control
Avion Div.
Berkeley Scientific Div.
Burroughs Corp.
Butler Mfg. Corp.
Cal-Tronics Corp.
Cincinnati Div.
Clary Multiplier
Clevite-Brush
Computer Research Corp.
Control Devices, Inc.

electronic counters

WE 210—$395

FREQUENCY METER
- Four Decades 10,000 units
- 10 to 50,000 cps — WE-110 $295
- 1 & 10 sec time bases

TIME INTERVAL METER
- 1 Kc & 10 Kc time base frequencies
- 0.0001 second resolution — WE-210 $395
- 0.005% accuracy

PRESET COUNTER
FOUR DECADES
- 0 to 5,000 cps — WE-310 $449
- Auto reset & cycle
- Pulse & relay outputs

FEATURING
- ✓ Low cost
- ✓ Small size
- ✓ Light weight
- ✓ Low power drain
- ✓ True portability
- ✓ Long life

Using cold cathode glow transfer tubes for digital indication and simplified circuitry for long life, reliability and low power dissipation.

Westport
ELECTRIC

write for free literature

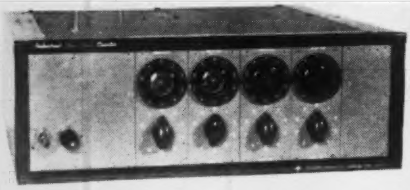
149 LOMITA STREET
EL SEGUNDO, CALIF.
ORegon 8-9993

For more information circle **119** on inquiry card.

ATOMIC'S

INDUSTRIAL COUNTERS AND CONTROLLERS
with UNITIZED CONSTRUCTION
for

- Straight Counting
- Process Control
- Quality Control
- Specialized Counting



Atomic's Counters and Counter Controllers are available in a wide range of speeds and count capacities for industrial needs. The instruments are uniquely adapted to specific requirements through the use of standardized plug-in strips or sub-assemblies.
Write for Bulletin 8-B.

TOTALIZERS
Instruments for straight counting by units, tens, dozens and gross.
- without registers
  - Slow counters. Speeds from 0 to 4000 counts/sec.
  - Fast counters. Speeds from 0 to 20,000 counts/sec.
- with registers
  - Slow counters. Units in ranges from 0-50, 0-60, 0-500, 0-600, 0-720 counts/sec.
  - Fast counters. Speeds from 0 to 20,000 counts/sec.

PRE-SET COUNTER-CONTROLLERS
Pre-set instruments actuate a single electric control circuit at a pre-determined count. Dual pre-set types actuate two control circuits at two different pre-determined counts in sequence.
- Single Pre-set. Count capacities from 99 to 999,999
  - Manual re-set, speeds 0 to 2000 counts/sec.
  - Automatic Re-set
    - Slow re-set. Max count rate 10/sec.
    - Fast re-set. Max count rate 250/sec.
- Dual Pre-set. Count capacities from 99 to 99,999
  - Manual re-set, speeds 0 to 2000 counts/sec.
  - Automatic Re-set
    - Slow re-set. Max count rate 10/sec.
    - Fast re-set. Max count rate 250/sec.

Atomic Instrument Company is also the leader in high quality instrumentation for atomic energy research

Scalers
Linear Amplifiers
High Voltage Supplies
Scintillation Detectors
Count Rate Meters
Differential Pulse Height Analyzers
Coincidence and Anticoincidence Instruments
Radiation Detectors
Dekatron Glow Tubes (Sole U.S. distributors)

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CAMBRIDGE 39, MASSACHUSETTS, U. S. A.
Representatives in principal cities, U.S. and abroad

For more information circle **120** on inquiry card.

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Devtronics, Inc.
Durant Mfg. Co.
Eeco Production
Electrical Develop.
Electrical & Phys. Inst.
Electronic Control Sys.
El Mec Labs.
El-Tronics, Inc.
Federal Telephone
Ford Instrument
G. E. Electronics Div.
Haledy Electronic Co.
Hetherington, Inc.
Hewlett-Packard
I-L-S Instrument
Industrial Elec. Controls
International Std. Trad.
Jessup Eng. & Dev.
Kay Electric Co.
Kearfott Co., Inc.
Librascope, Inc.
Little, Inc., Arthur
Lumenite Electronic Co.
Metrotype Corp.
Minnesota Electronics
Norden-Ketay Corp.
Nuclear Chicago
Nuclear Measurements
Nuclear Research
Peschel Electronics
Post Machinery Co.
Potter Aeronautical
Potter Instrument
Probescope Company
Radiation Inst. Dev. Lab.
Radioactive Products, Inc.
R-C Scientific Inst.
Rea Company
Richardson Scale Co.
Scientific Specialties
Special Insts. Lab.
Standard Elec. Time
Standard Piezo
Streeter-Amet Co.
Sunshine Scientific
Taller & Cooper, Inc.
Technical Associates
Telecomputing Corp.
Thordarson-Meissner
Virginia Electronics
Walkirt Co.
Westport Electric
Wilson & Co., G. C.
Worner Electronic Devices

COUNTERS, Footage
Adde & Co.
Anatron Engg.
Barbour-Stockwell
Bogue Electric Mfg. Co.
Bristol Co.
Cook Electric
Counter & Control Corp.
Dittmore & Freimuth
Durant Mfg. Co.
Elec. Tachometer Corp.
Electrical Develop.
Engler Inst. Co.
G. M. Mfg. Co.
Gordon Enterprises
Haledy Electronic Co.
Hetherington, Inc.
Indus. Nucleonics
Maxson Instruments
McDonnell Odometer Corp.
Minneapolis Elec.
Nucleonic Corp.
Olympic Instrument Labs.
Presin Co.
Post Machinery Co.
Potter Instrument
Production Instrument
Richardson Scale Co.
Streeter-Amet
Veeder-Root, Inc.
Zernikow Co.

COUNTERS, Geiger-Muller
Abrams Instrument
Air-O-Tronics
American Instrument
American Tradair Corp.
Amperex Electronic
Anton Electronics Labs.
Atomic Instrument
Atomlab, Inc.
Bendix Red Bank Div.
Berkeley Scientific Div.
Cambridge Inst. Co.
Canadian Radium
Corbett Science Labs.
Coulter Electronics
Cyclotron Specialties
Daystrom Inst.
Detectolab, Inc.
Detectron Co.
Distillation Products
Douglas Instrument Labs.
Eck & Krebs
Eclipse-Pioneer Div.
Electrical & Phys. Inst.
Electronic Products
El-Tronics, Inc.
Fisher Research
Flett Lab.
Forro Scientific
General Electric
General Radio Co.
Geophysical Instrument
Georator Corp.
Goldak Co.
Herback & Rademan
Inst. Development Labs.
Jordan Electronic Mfg. Co.
Landsverk Electrometer
Leighton Labs., H. W.
Librascope, Inc.
Menlo Research Lab.
Microchemical Specialties
North American Philips
NRD Instrument Co.
Nuclear, Chicago
Nuclear Dev. Lab.
Nuclear Measurements
Nuclear Research
Nuclear Science
Potter Instrument
Precision Radiation
Radiation Counter Labs.
Radiation Inst. Dev. Labs.
Radioactive Products
Raytheon Mfg. Co.
R-C Scientific Inst.
Southwestern Ind. Elec.
Stoelting Co., C. H.
Stratex Instrument Co.
Streeter-Amet Co.
Sylvania Elec. Prod.
Technical Associates
Technical Measurement
Thordarson-Meissner
Tracerlab, Inc.
Ultra-Violet Products
Universal Atomic Corp.
Universal X-Ray Products
Vacutron, Inc.
Victoreen Instrument Co.
Welch-Allyn Inc.
Welch Scientific
Western Radiation Labs.
Wilmar Mfg.
Wood Counter Lab.

COUNTERS, High Speed
Abrams Instrument
ACF Electronics Div.
Advance Electronics
Ahrendt Instrument
American Electronic Labs.
Anatron Engg.
Atomic Instrument
Austin Co.
Berkeley Scientific Div.
Bowmar Instrument
Brush Electronics
Burroughs Corp.
Butler Mfg. Corp.
Cal-Tronics Corp.
Corbett Science Labs.
Cyclotron Specialties
Detectron Co.
Durant Mfg. Co.
Electrical Development
Electrical & Phys. Inst.
Electronic Control Sys.
Electronic & Engg. Serv.
Electro-Pulse Inc.
Engineering Res. Assoc.
Haledy Electronics
Hetherington Inc.
Hewlett-Packard
I-L-S Instrument
Industrial Elec. Controls
International Std. Trad.
Jacobs Inst. Co.
Landis & Gyr Inc.
Metrotype Corp.
Norden-Ketay
Post Machinery Co.
Potter Instrument
Presin Co.
Production Instrument
Radiation Inst. Dev. Lab.
Raycon Corp.
Rea Company
Special Instruments Lab.
Stoelting Co., C. H.
Stratex Instrument Co.
Streeter-Amet
Telecomputing Corp.
Thordarson-Meissner
Veeder-Root
Walkirt Co.
Westport Electric

COUNTERS, Hour
Aero Instrument
Alina Corp.
Automatic Temp. Control
Barbour-Stockwell
Burlington Instrument
Clary Multiplier
Cramer & Co., Inc.
Doelcam Corp.
Durant Mfg. Co.
Elec. Tachometer Corp.
Engler Inst. Co.
G E Instrument Dept.
Gorrell & Gorrell
Haledy Electronic Co.
Haydon Co., A. W.
Industrial Timer Corp.
Lumenite Electronics
Marion Inst.
Paragon Electric Co.
Phillips Petroleum
Presin Co.
Production Instrument
Revere Corp.
Standard Elec. Time
Streeter-Amet Co.
Telechron, Inc.
Veeder-Root
Vocaline Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.

COUNTERS, Lumber
Adde & Co.
Anatron Engg.
De-Tec-Tronic Corp.
Dittmore & Freimuth
Durant Mfg. Co.
Keuffel & Esser Co.
Lufkin Rule Co.
McDonnell Odometer Co.
Moisture Register Co.
Potter Instrument
Presin Co.
Production Instrument
Veeder-Root, Inc.

COUNTERS, Mechanical
Adde & Co.
American Time Prods.
Anatron Engg.
Atomic Instruments
Automatic Temp. Control
Barbour-Stockwell
Beam Insts. Corp.
Borg. Corp.
Bowmar Instrument
Clary Multiplier
Coleman Engr.
Counter & Control Corp.
Cyclotron Specialties
Dittmore & Freimuth
Durant Mfg. Co.
Electrical Devel.
Endevco Corp.
Ford Instrument
Genisco, Inc.
Gordon Enterprises
Haledy Electronic Co.
Hart Mfg. Co., R. E.
Kearfott Co.
Landis & Gyr, Inc.
Opplem Co., Inc.
Photocon Research
Presin Co.
Production Instrument
Raycon Corp.
Redington Co., F. B.
Richardson Scale Co.
Streeter-Amet Co.
Veeder-Root, Inc.

COUNTERS, Photoelectric
ACF Electronics Div.
American Electronic Labs.
Atomic Instrument
Autotron Co.
Avion Div.
Berkeley Scientific
Cal-Tronics Corp.
Corbett Science Labs.
Daytronic Corp.
Detect-O-Ray
De-Tec-Tronic Labs
Dittmore & Freimuth
Durant Mfg. Co.
Electronic Controls
Electronic Prod. Co.
Electronics Corp. of Am.
Electro-Physics Co.
El-Tronics, Inc.
Engineering Res. & Dev.
Ess Instrument Co.
Fisher-Pierce Co.
Flett Lab.
General Electric Co.
Haledy Electronic
Hewlett Packard
Industrial Electronic
Industrial Electronics
International Std. Trading
Kaye Development
Lumenite Electronic
Magnetic Amplifiers
Martin-Hubbard Corp.
Metrotype Corp.
NRD Instrument Co.
Phoenix Precision Inst.
Post Machinery
Potter Instrument
Presin Co.
Production Instrument
Rockwell Engr.
R-C Scientific Inst.
Scientific Specialties
Sherron Metallic
Spellman Television
Standard Elec. Time
Standard Piezo
Sticht Co.
Streeter-Amet Co.
Sunshine Scientific
Telecomputing Corp.
Thordarson-Meissner
Vacutron, Inc.
Veeder-Root, Inc.
Walkirt Co.
Weston Electrical Inst.
Worner Electronic Devices

COUNTERS, Predetermined
Atomic Instrument Co.
Berkeley Scientific Div.
Burroughs Corp.
Corbett Science Labs.
Counter & Control Corp.
Detectron
Industrial Electronics
Marconi Instruments
Nemeth Labs.
North American Philips
Nucleonic Co. of America
Photocon Research Prod.
Post Machinery Co.
Potter Instrument
Probescope Co.
Production Instrument Co.
Raycon Corp.
Scientific Specialties
Spencer Mfg. Co.
Taller & Cooper Inc.
Veeder-Root, Inc.
Westport Electric Co.
Westronics, Inc.

COUNTERS, Production
Abrams Instrument
Acromark
Adde & Co.
Alina Corp.
Anatron Engg.
Atomic Instrument
Automatic Elec. Chicago
Autotron Co.
Barbour-Stockwell
Berkeley Scientific Div.
Bristol Co.
Butler Mfg. Corp.
Cincinnati Time Recorder
Clevite-Brush
Control Devices Inc.

Cook Electric
Corbett Science Labs.
Counter & Control Corp.
Cramer & Co., Inc.
Cyclotron Specialties
Daytronic Corp.
Detect-O-Ray
Dittmore & Freimuth
Durant Mfg. Co.
Eagle Signal
Elec. Tachometer Corp.
Electrical Devel.
Electronic Controls
Electronics Corp. of Am.
Engr. Research & Dev.
General Electric Co.
Gorrell & Gorrell
Guardian Elec.
Haledy Electronic Co.
Hart Mfg. Co., R. E.
Hetherington Inc.
Instrument Lab., Inc.
Krohn-Hite Inst.
Landis & Gyr, Inc.
McDonnell Odometer Co.
Menlo Research Lab.
Moisture Register Co.
Pacific Transducer
Post Machinery Co.
Potter Instrument
Presin Co.
Production Inst. Co.
Raycon Corp.
Redington Co.
Richardson Scale Co.
Rowe Radio Research
Shallcross Mfg.
Standard Elec. Time
Streeter-Amet Co.
Struthers Dunn
Thordarson-Meissner
Veeder-Root, Inc.
Walkirt Co.

COUNTERS, Radiation
American Tradair Corp.
Anton Electronics Labs.
Atomic Instrument
Atomlab, Inc.
Bendix Red Bank Div.
Berkeley Scientific Div.
Corbett Science Labs.
Daystrom Inst.
Detectolab, Inc.
Detectron Co.
Douglas Radio Labs.
Electronic & Engg. Serv.
Electronic Products Co.
El-Tronics, Inc.
Forro Scientific
G.E. Apparatus Sales
General Radio
Geophysical Instrument
Georator Corp.
Giannini & Co.
Goldak Co.
Hansen Co., Wm.
Hewlett-Packard
I-L-S Instrument
Instruments, Inc.
Jordan Electronic Mfg.
Librascope
MacDonald Co., W. S.
Microchemical Specialties
North American Philips
NRD Instrument Co.
Nuclear Chicago
Nuclear Dev. Lab.
Nuclear Measurements
Nuclear Research
Nuclear Science
Nucleonic Corp.
Ohmart Corp.
Pacific Transducer
Potter Instrument
Precision Radiation
Radiation Counter Labs.
Radioactive Products
Radiation Inst. Dev.
Raytheon Mfg.
R-C Scientific Inst.
Servo Corp. of America
Special Insts. Lab.
Stratex Instrument
Streeter-Amet Co.
Technical Associates
Technical Measurement
Tracerlab
United Engineers
Universal Atomic Corp.
Victoreen Inst. Co.
Walkirt Co.
Western Radiation Lab.
Wood Counter Lab.

COUNTERS, Recording
Advance Electronics
Anatron Engg.
Atomic Instrument
Austin Company
Berkeley Scientific Div.
Bristol Co.
Brush Electronics
Clary Multiplier
Clevite-Brush
Corbett Science Labs.
Dittmore & Freimuth
Durant Mfg. Co.
Electrical Develop.
Endevco Corp.
General Elec. Co.
Genisco, Inc.
Haydon Mfg. Co.
Hewlett-Packard
Metrotype Corp.
Nucleonic Corp.
Photocon Research
Potter Instrument Co.
Presin Co.
Radiation Counter Labs.
R-C Scientific Inst.
Richardson Scale Co.
Special Instruments Lab.
Stoelting Co., C. H.
Stratex Instrument Co.
Streeter-Amet Co.
Taller & Cooper, Inc.
Veeder-Root, Inc.
Western Radiation Lab.

COUNTERS, Revolution
Adde & Co.
Anatron Engg.
Associated Research
Atomic Instrument
Automatic Temp. Control
Barbour-Stockwell
Berkeley Scientific Div.
Boulin Instrument Corp.
Bowmar Instrument
Bristol Co.
Brown & Sharpe
Coleman Engr.
Cook Electric
Counter & Control Corp.
Cummings Machine Wks.
Cyclotron Specialties
Detectron Co.
Dittmore & Freimuth
Dormitzer Elec. & Mfg.
Durant Mfg. Co.
Eagle Signal
Elec. Tachometer Corp.
Electrical Develop.
Endevco Corp.
Engler Instrument
Engr. Research & Dev.
G. E. Apparatus Sales
General Radio
Genisco, Inc.
Gordon Enterprises
Gurley, W. & L. E.
Hart Mfg. Co., R. E.
Ideal Commutator
Industrial Elect. Controls
Industrial Timer Corp.
I-L-S Instruments
Jaeger Watch Co.
Jones Motorola Corp.
Kearfott Co., Inc.
Krohn-Hite Inst.
Mason-Neilan Regulator
McDonnell Odometer Co.
Millers Falls
Moisture Register Co.
Pacific Scientific
Photocon Research
Potter Instrument
Presin Co.
Production Inst. Co.
Raycon Corp.
Redington Co.
Richardson Scale
Scherr Co., Inc., George
Standard Electric Time
Starrett Co., L. S.
Streeter-Amet Co.
Taller & Cooper
Veeder-Root, Inc.
Walkirt Co.
Warren-Knight Co.
Westport Electric
Zernickow Co., O.

COUNTERS, Scintillation
American Tradair Corp.
Anton Electronics Labs.
Atomic Instrument
Atomlab, Inc.
Berkeley Scientific Div.
Beva Laboratory
Chatham Electronics
Corbett Science Labs.
Daystrom Inst.
Detectolab, Inc.
Detectron Co.
Douglas Radio Labs.
Electronic & Engg. Serv.
El-Tronics, Inc.
Fisher Research
Forro Scientific
GE Apparatus Sales
Goldak Co.
Hansen Co., Wm.
Hewlett-Packard
International Standard
Kaye Development
Librascope
MacDonald Co., W. S.
Menlo Research Lab.
Mt. Sopris Instrument
National Radiac
North American Philips
NRD Instrument Co.
Nuclear Chicago
Nuclear Measurements
Nuclear Research
Nuclear Science
Nucleonic Corp.
Potter Instrument
Precision Radiation
Radiation Counter Labs.
Radiation Inst. Dev. Lab.
Radioactive Products
R-C Scientific Inst.
Stratex Inst.
Technical Associates
Telecomputing Corp.
Tracerlab, Inc.
Victoreen Inst. Co.
Western Radiation Lab.
Wood Counter Lab.
Universal Atomic Corp.

COUNTERS, Stroke
Adde & Co.
Anatron Engg.
Atomic Instrument
Automatic Temp. Control
Berkeley Scientific Div.
Bristol Co.
Clevite-Brush
Cook Electric
Counter & Control Corp.
Dittmore & Freimuth
Durant Mfg. Co.
Eagle Signal Corp.
Electrical Dev.
Engr. Research & Dev.
Gorrell & Gorrell
Guardian Elec. Mfg. Co.
Hagen Mfg. Co.
Hart Mfg. Co., R. E.
Impact Register
International Register Co.
McDonnell Odometer Co.
Moisture Register Co.
Potter Instrument
Presin Co.
Raycon Corp.
Redington Co.
Richardson Scale Co.
Streeter-Amet Co.
Taller & Cooper
Veeder-Root, Inc.
Walkirt Co.

COUNTERS, Twist
Dittmore & Freimuth
Electrical Dev.
McDonnell Odometer Co.
Potter Instrument
Presin Co.
Scott Testers, Inc.
Suter, Alfred
U.S. Testing
Veeder-Root, Inc.

COUNTERS, Vehicular
Aero Instrument
Aristo Import Co.
Barbour-Stockwell
Corbett Science Labs.
Dittmore & Freimuth
Engler Inst. Co.
General Electric
Presin Co.
Streeter-Amet Co.
Taller & Cooper
Veeder-Root, Inc.

COUPLINGS (See Tube Fittings)

COURSE PROTRACTORS (See Protractors, Course)

CRYPTOMETERS, Paint
Bausch & Lomb Optical Co.
Drage Products
Koehler Inst. Co.
Lapine & Co.

CRYSTALS, Piezoelectric
Bausch & Lomb Opt.
Bio-Rad Labs.
Bliley Electrical Co.
Branson Instruments
Brush Electronics Co.
Centralab Div.
Clevite-Brush
Crystal Research Labs.
Dearborn Scientific
Endevco Corp.
E & W Optical Co.
General Elec. Co.
General Radio Co.
Gulton Mfg.
Helio Instrument
International Dev. Co.
Knights Co.
McCoy Electronics
North Amer. Philips
Premier Research Labs.
RCA Div.
Reeves Hoffman Corp.
Standard Arcturus
Standard Piezo Co.
Valpey Crystals
Vectron, Inc.

CRYSTALS, Quartz
Bio-Rad Labs.
Bliley Electric Co.
Bodnar Industries
Branson Instruments
Brush Electronics
Clevite-Brush
Crystal Research Labs.
Dearborn Scientific
E & S Optical Co.
E & W Optical Co.
Fecker, Inc.
Federal Telegraph Co.
Flett Laboratory
Fuess, Inc.
Gaertner Scientific
General Elec. Co.
General Radio Co.
Harvey Radio Labs.
Helio Instrument
International Crystal
International Dev. Co.
International Std. Trading
Kaar Eng'ng
Knights Co.
McCoy Electronics
North Amer. Philips
Premier Research Labs.
RCA Div.
Reeves Hoffman Corp.
Standard Arcturus
Standard Piezo Co.
Unertl Optical Co.
Valpey Crystal Corp.
Vectron, Inc.
Western Electric

CRYSTALS, Rochelle Salt
Atomic Instrument
Bendix Aviation Corp.
Bio-Rad Labs.
Brush Electronics
Clevite-Brush
Dearborn Scientific
Fecker, Inc.
Helio Instrument
International Dev. Co.
Unertl Optical Co.
Wallace & Tiernan

CRYSTALS, Tourmaline
Bio-Rad Labs.
Clevite-Brush
Dearborn Scientific
Fecker, Inc.
Fuess, Inc.
Helio Instrument
International Dev. Co.
Knights Co.
Premier Research Labs.
Radiation Counter Labs.
Unertl Optical Co.
Valpey Crystal Corp.
Zeiss, Inc., Carl

CUBIC FOOT BOTTLES (See Bottles, Cubic Feet)

"Heat Inertia" in Problems of Automatic Control of Temperature
By Victor Broida
Stiff paper, 64 pages. $1.00 postpaid
Instruments Publishing Co.
845 Ridge Ave. Pittsburgh 12, Pa.

CUBICLES (See Control Boards, Weatherproof Housings, etc.)

CURRENT LIMITERS
Assembly Products
Bendix Red Bank Div.
Betts & Betts
Bradley Laboratories
Burndy Engineering
Edison, Inc. Thomas
Electric Regulator Co.
Fisher-Pierce Co.
General Elec. Co.
G-V Controls Inc.
Hagan Corp.
Larson Instrument
Magnetic Research Corp.
Manning, Maxwell & Moore
RCA Div.
Thordarson Elec. Mfg.
Victory Engr.
Westinghouse Electric

CURRENT METERS (See Meters, Current)

CURRENT REGULATORS (See Regulators, Current)

CURVE FOLLOWERS
Aero Electronics
Electronic Associates
Logistics Research Inc.
Moseley Co.
Potter Inst. Co.
Scientific Specialties
Westronics, Inc.

CURVE TRACERS (See Drawing Instruments)

CUTMETERS
Amthor Testing Inst. Co.
Elec. Tachometer Corp.
Jarco Services
McDonnell Odometer Co.
Veeder-Root, Inc.
Zernickow, O.

CYCLE CONTROLLERS (See Controllers, Automatic, Cycle)

CYCLE COUNTERS (See Counters, Cycle)

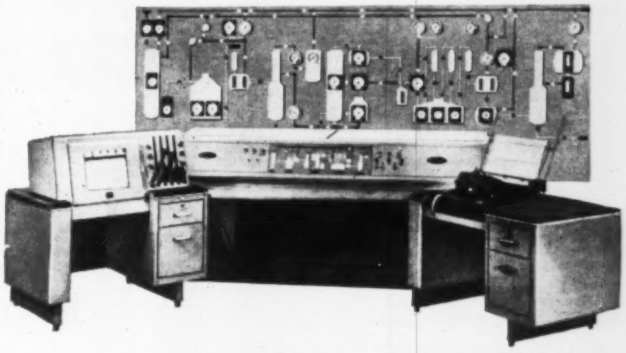
CYCLOMETERS
Penn Ind. Inst. Corp.
Veeder-Root, Inc.

CYLINDERS, Air and/or Hydraulic
Airmatic Valve, Inc.
Annin Co.
Autoclave Engrs., Inc.
Conoflow Corp.
Foxboro Co.
Hagan Corp.
Hanna Engr'ng Wks.
Instrument Dev. & Mfg.
Johnson Service
Rahn & Co.
Lear, Inc.
Ledeen Mfg. Co.
Mead Specialties Co.
Schrader's Son
Studebaker Hydraulic
Vickers, Inc.

CYLINDERS, GRADUATED (See Apparatus Laboratory, Glass)

DATA-HANDLING SYSTEMS, Automatic
ACF Electronics
Ahrendt Instrument Co.
Air Associates
Air Research Mfg.
American Helicopter Div.
Austin Company
Bendix Pacific Div.
Berkeley Scientific
Bristol Engg.
Burroughs Corp.
Commercial Controls Corp.
Computer Control Co.
Donner Scientific
Electro-Data Corp.
Electronic Control Systems
Fielden Instrument
Fischer & Porter Co.
Franklin Electronics
Giannini & Co.
Hanson-Gorrill-Brian
Indikon Company
L & O Research & Dev.
Logistics Research Inc.
Metrotype Corp.
Moseley Co.
Mountain Systems Inc.
Nelson Instrument
North American Inst.
Panellit, Inc.
Post Machinery Co.
Potter Inst. Co.
Rea Co. Inc., J. B.
Remington Rand
Sterling Precision
Taller & Cooper Inc.
Telecomputing Corp.
Ultrasonic Corp.
Westronics, Inc.

DATA PROCESSING EQUIPMENT (See also Computers)
ACF Electronics
Ahrendt Instrument
Air Associates
Analex Corp.
Austin Company
Berkeley Scientific
Bristol Engg.
Burroughs Corp.
Commercial Controls Corp.
Corbett Science Labs.
Donner Scientific
Electro-Data Corp.
Electromec, Inc.
Electronic Control Systems
Fischer & Porter Co.
Fish-Schurman Corp.
Franklin Electronics
Genisco Inc.
Hanson-Gorrill-Brian
Int'l Business Machines
Kleinschmidt, Inc.
Logistics Research, Inc.
Metrotype Corp.
Moseley Co.
Mountain Systems Inc.
North American Insts.
Panellit, Inc.
Rea Co. Inc., J. B.
Remington Rand
Sterling Precision
Taller & Cooper Inc.
Technitrol Eng'ng Co.
Telecomputing Corp.
Ultrasonic Corp.



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Panellit Information Systems provide complete, centralized control to management. In one co-ordinated system, all the functions of effective control and data reduction are available.

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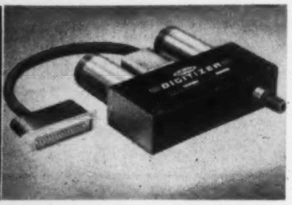

Automation
Data Reduction
Digital Systems

These electromechanical products designed and manufactured by Coleman can save you money by speeding up data reduction and increasing accuracy.

DIGITIZER® (see illustration)—A shaft position decimal converter which actuates card or tape punching machines, printers, and other data storing or indicating devices. Digitizers are used in AUTOMATION systems to digitally start and stop mechanical motion.

OSCILLOGRAM READER—By recording trace deflection measurements directly into punched card machines, reading time can be speeded up by a factor of 7 to 10. Practically no operator experience is necessary to achieve fast and highly accurate results.

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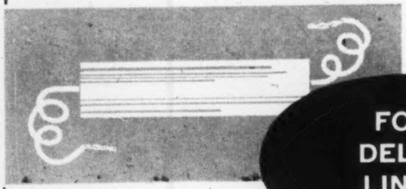

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- Distributed Constant
  Standard single-stick lines.
  0.05 to 2.0 usec. delay.
  250 to 5,000 ohms characteristic impedance.
  Bandwidth up to 20 megacycles for less compact designs.
  Other values quickly built to your specifications.
- Lumped Constant
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  25 to 20,000 ohms characteristic impedance.
  Bandwidth up to 20 megacycles for less compact lines with relatively short delays.
- Environmental
  All designs meet MIL-T-27 Specification where applicable.
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PCA ELECTRONICS, INC.

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SANTA MONICA, CALIF.
TExas 0-6716 EXbrook 4-1193

For more information circle **123** on inquiry card.

DATA REDUCTION INSTRUMENTS
Aero Electronics
Ahrendt Instrument
American Inst. Corp.
Berkeley Scientific
Coleman Eng'ng Co.
Electro-Data Corp.
Electronic Control Systems
Epsco, Inc.
Fischer & Porter Co.
Franklin Electronics
Genisco Inc.
Hanson-Gorrill-Brian
Metrotype Corp.
Moseley Co.
North American Inst.
Panellit, Inc.
Remington Rand
Shepard Labs.
Sterling Precison
Taller & Cooper Inc.
Telecomputing Corp.
Ultrasonic Corp.
Westronics, Inc.

DECADE BOXES, Resistance, Capacitance, Inductance
Aerovox Corp.
Alco Electronics
Berkeley Scientific
Cornell Dublilier
Daigger & Co.
Eastern Precision Resistor
Electro-Measurements, Inc.
Elctronic Measurements
Freed Transformer Co.
General Elec. Inst.
Hycor Company
Leeds & Northrup Co.
Ohmite Mfg. Co.
Physics Research Labs
Reiner Electronics Co.
Rochester Electronics
Rubicon Co.
Scientific Specialties
Shallcross Mfg. Co.
Telex, Inc.
United Optical

DECELEROMETERS (See Accelerometers)

DECIBEL METERS (See Sound Level Meters)

DEEP SEA INSTRUMENTS
Atlantic Research
Bendix Aviation Corp.
Bristol Co.
Brush Electronics
Chesapeake Inst.
General Precision
G. M. Mfg. Co.
Kahl Scientific Inst.
Moeller Inst. Co.
Pacific Div.
Raytheon Mfg. Co.
Taylor Inst. Cos.
Trimount Inst. Co.
Varo Mfg. Co.
Weksler Thermometer
Wianko Engineering

DEFLECTION TESTERS, Light Wave (See Testers, Deflection, Light Wave)

DEFORMETERS
Baldwin-Lima-Hamilton
Dietert Co.

DEHYDRATORS, Instrument Air (See Dryers, Instrument Air)

DELAY LINES
Aerovox Corp.
Alto Scientific
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Brinkmann Instruments
Bristol Co.
Cambridge Instrument
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Eastman Kodak Co.
Electronics Corp. of Am.
Epic, Inc.
Farrand Optical
Ferner Co.
Fish-Schurman
Fisher Scientific
Fish-Schurman Corp.
Foxboro Co.
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Mico Inst. Co.
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Natl. Spectrographic Labs.
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Poole Instruments, Inc.
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Rockwell Engr.
Spinco Div.
Testing Machines, Inc.
Ultrasonic Engr. Co.
United Engineers
Vectron, Inc.
W. M. Welch Scientific Co.
Weston Elec. Inst.
Williams, Brown & Earle
Zeiss, Inc., Carl
Zoomar Corp.

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North American Philips
Permutit Co.
Phoenix Precision Inst.

DENSITOMETERS, Liquid
Maxson Instrument
North American Philips
Ohmart Corp.
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Ercona Corp.
Fish-Schurman Corp.
Gaertner Scientific
Helio Instrument
Inst. Dev. Labs.
Mfgs. Engrg. & Equip.
Phoenix Precision Inst.
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Specialized Insts. Corp.
Will Corp.

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Polytechnic Res. & Dev.
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Universal Atomic Corp.
Victoreen Inst. Co.
Western Radiation Lab.
Wood Counterlab

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United Engineers
Victoreen Inst. Co.
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Wood Counterlab

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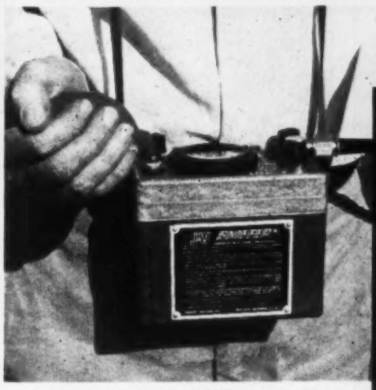

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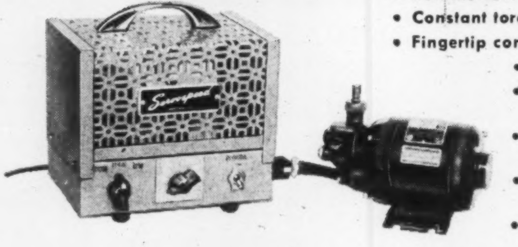

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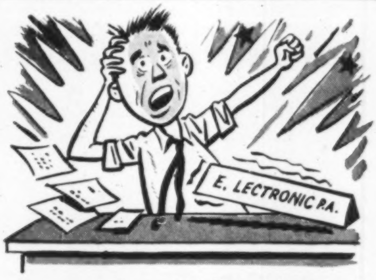
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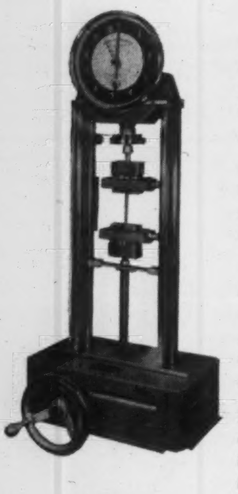

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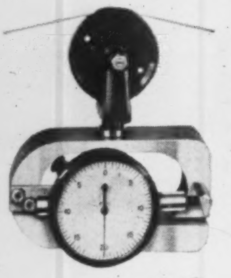

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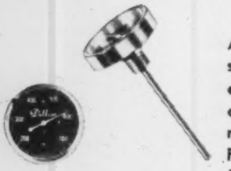

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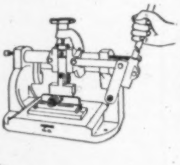

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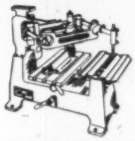

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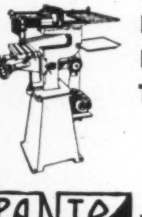

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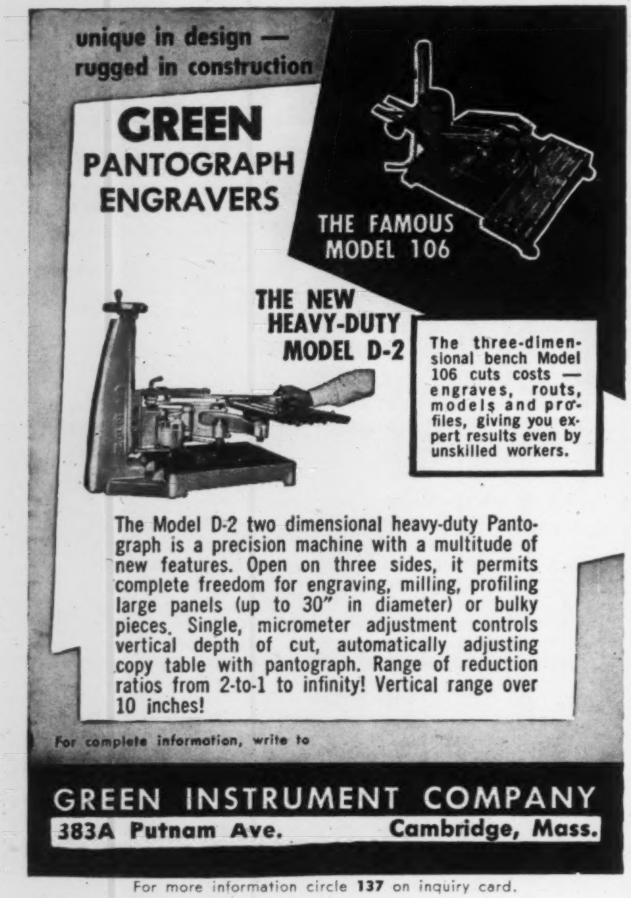
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Bailey Meter Co.
Bristol Co.
Brooks Rotameter Co.
Builders-Providence
Central Station Steam
Elec. Indicator Co.
Fischer & Porter
Foxboro Co.
Hagan Corp.
Henszey Co.
Industrial Inst. Corp.
Lapp Insulator
Leeds & Northrup
Mason-Neilan Regulator
Minneapolis-Honeywell
Moore Products
Penn Ind. Inst. Div.
Republic Flow Meters
Simplex Valve & Meter
Sparling, R. W.
Taylor Inst. Cos.

FEED WATER TESTING APPARATUS
Allis-Chalmers
Burrell Technical Supply
Central Scientific Co.
Hagan Corp.
Hellige, Inc.
Industrial Insts., Inc.
LaMotte Chemical Prod.
Leeds & Northrup Co.
Palo Lab. Supplies
Palo-Myers
Pfaltz & Bauer, Inc.
Phipps & Bird
Photovolt Corp.
Taylor & Co., W. A.

FEEDERS, Automatic, Granular Material
Builders-Providence
Exact Weight Scale Co.
Federal Classifier
Jeffrey Mfg. Co.
Merrick Scale
Omega Machine
Permutit Co.
Proportioneers, Inc.
Schaffer Poidometer Co.
Thayer Scale & Eng'ng
Wallace & Tiernan
Weighing Components

FEEDERS, Automatic, Proportioning
Arlin Products, Inc.
Automatic Temp. Control
Bowser Inc.
Builders-Providence
Exact Weight Scale Co.
Fischer & Porter
General Controls
Hankison Corp.
Henszey Co.
Jeffrey Mfg. Co.
Lapp Insulator
Logeman Co., C. W.
Merrick Scale
Milton Roy Co.
National Instrument Co.
Omega Machine
Orchem Pump Div.
Permutit Co.
Proportioneers, Inc.
Schaffer Poidometer Co.
Thayer Scale & Engrg.
Wallace & Tiernan
Weighing Components

FIELD RHEOSTATS (See Rheostats, Field)

FIELD-STRENGTH MEASURING SETS
American Electroneering
Clarke Inst. Corp.
Empire Devices, Inc.
Federal Telephone
Ferris Inst. Corp.
General Elec. Co.
Georator Corp.
Kahn & Co.
Marconi Instruments
Marion Inst.
McFarlin Co.
Measurements Corp.
Panoramic Radio Co.
RCA Div.
Sensitive Research Inst.
Sherron Metallic
Stoddard Aircraft Radio
Tobe Deutschmann Corp.

FILLING MACHINES, Automatic
All Amer. Tool & Mfg.
Allis-Chalmers
Anderson Bros. Mfg. Co.
Automatic Scale
Baltimore Biological Lab.
Bowser Inc.
Brinkmann Instruments
Burrows Equipment Co.
Exact Weight Scale Co.
G-M Mfg. Co.
Hadley Assoc.
International Instrument
National Instrument
Pfaudler Co.
Pneumatic Scale Corp.
Potter Instrument
Proportioneers, Inc.
Richardson Scale Co.
Scientific Glass App.
Sorvall Inc., Ivan
Stokes Machine Co., F. J.
Thayer Scale & Engrg.
Triangle Package Mach.
Weighing Components

FILLING MACHINES, Bag
Exact Weight Scale
Hadley Assoc.
Thayer Scale & Engrg.
Weighing Components

FILLING MACHINES, Barrel
Bowser, Inc.
Exact Weight Scale
Hadley Assoc.
Thayer Scale & Engrg.
Toledo Scale Co.
Weighing Components

FILLING MACHINES, Can
Bowser, Inc.
Exact Weight Scale
G-M Mfg. Co.
Hadley Assoc.
Logeman Co., C. W.
Pfaudler Co.
Pneumatic Scale Corp.
Proportioneers, Inc.
Thayer Scale & Engrg.
Weighing Components

FILLING MACHINES, Carton
Hadley Assoc.
Pneumatic Scale Corp.
Thayer Scale & Engrg.
Weighing Components

FILTERS, Compressed Air (See Air Cleaners)

FILTERS, Electrical Wave
Aero Instrument Co.
Aerovox Corp.
Airborne Instruments
Audio Development Co.
Balco Res. Labs.
Bendix Aviation Corp.
Berkshire Laboratories
Burnell & Co.
Cal-Tronics Corp.
Campbell Co., J. A.
Carad Corp.
Centralab Div.
Chicago Transformer
Cinema Engr.
Clevite-Brush
Clippard Inst. Lab.
Communication Accessories
Cuno Engg. Corp.
DeMornay-Bonardi, Inc.
Eastern Prec. Resistor
Elec. Computer Div.
Electronic Transformer
Federal Telephone
Femco, Inc.
Freed Transformer Co.
General Radio
Gertsch Products
Gulton Mfg. Co.
Hewlett-Packard
Hogan Labs.
Hycor Co.
Industrial Test Equip.
Insuline Corp. of Amer.
Kay Electric Co.
Kay-Lab
Kearfott (Western)
Kenyon Transformer
Keystone Products
Krohn-Hite Inst. Co.
Lenkurt Electric
Marconi Inst. Ltd.
McShan Dev. Co.
New Jersey Electronics
New York Transformer
Non-Linear Systems
Pacific Div.
Pacific Instrument
Philbrick Researches
Polyphase Instrument
Ramapo Engr. Co.
Raytheon Mfg. Co.
San Fernando Electric
Scott, Inc., Hermon
Spencer-Kennedy
Sprague Electric Co.
Telechrome Inc.
Thordarson-Meissner
Tobe Deutschman
Transformer Engrs.
United Transformer Corp.
Veetron Inc.
Western Electro-Acous.
White Inst. Labs.
Wilmar Mfg.

FILTERS, Instrument Air
Anders Co.
Cuno Engr.
Dollinger Corp.
Hankison Corp.
Industrol Corp.
Kemp Mfg.
Lab Constr. Co.
Logan Engrg.
Mason-Neilan Reg.
Pittsburgh Lectrodryer
Pritchard & Co.

FILTERS, Light(See also Filters, Optical)
American Inst. Co.
Baird Associates
Bausch & Lomb Opt.
Bell & Howell
Bolsey Corp.
Central Scientific Co.
Corning Glass Works
Crystal Research Labs.
Dearborn Scientific
E & S Optical
Farrand Optical
Fish-Schurman Co.
Gaertner Scientific
Gates & Co., George W.
General Elec. X-Ray Corp.
Goerz Amer. Optical Co.
Gordan Enterprises
Helio Instrument
International Dev. Co.
Kollmorgan Optical Co.
Leitz, Inc.
Mark Polarized
Mico Instrument Co.
Perkin-Elmer Corp.
Phoenix Precision Inst.
Precise Measurements Co.
Simpson Optical Mfg. Co.
Servo Corp. of America
Zeiss, Inc., Carl

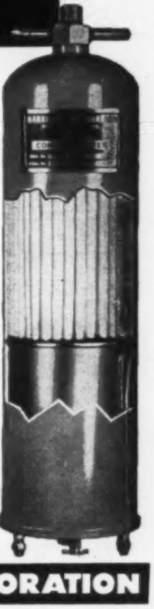
FILTERS, Optical
Alfa Optical Corp.
American Optical Co.
Baird Associates
Bausch & Lomb Optical
Binswanger & Co.
Boehmke Optical Co.
Bolsey Corp.
Bray Optical Co.
Burke & James, Inc.
Corning Glass Works
Crystal Research Labs.
Dearborn Scientific
Eastman Kodak Co.
Electro-Physics
E & S Optical
Farrand Optical Co.
Ferner Co.
Fecker, J. W.
Fish-Schurman
Fosdick Glass Co.
Gaertner Scientific
General Scientific Corp.
Georator Corp.
Goerz Amer. Optical Co.
Gordon Enterprises
Hayward Optical Glass
Helio Instrument
Henson Co., Fred C.
International Dev. Co.
Jarrell-Ash
Jones Optical Works
Klett Mfg. Co.
Mann Co., W. I.
Mark Polarized
Pacific Universal Prod.
Pancro Mirrors
Perkin-Elmer Corp.
Pfaltz & Bauer, Inc.
Phoenix Precision Inst.
Photovolt Corp.
Precise Measurements Co.
Pyrometer Inst. Co.
Republic Lens
Rubicon Co.
Rudolph & Sons
Schutte Optical
Simpson Optical Mfg.
Testrite Instrument Co.
Triumph Mfg. Co.
Unertl Optical Co.
Univis Lens Co.
Wollensak Optical
Zenith Optical Lab.

FILTERS, Radio Noise
Aerovox Corp.
Air Research Mfg.
Astron Corp.
Balco Research Labs.
C.G.S. Labs.
Chicago Condenser Co.
Colortone Electronics
Cornell Dublilier
ESC Corp.
Freed Transformer Co.
Hopkins Engg.
Insuline Corp. of America
Lear Inc.
Magnetic Instrument
Moran Electronic Com.
Radex Corp.
San Fernando Electric
Sangamo Electric
Scientific Specialties
Shielding, Inc.
Sprague Electric
Superex Electronics Corp.
Televiso Corp.
Texas Instruments
Thordarson-Meissner Mfg.
Tobe Deutschmann Corp.

FILTERS, WATER
Crystal Research Labs.
Daigger & Co.
Fisher Scientific

FINDERS, Valve Box
Detectron
Georator Corp.
Globe Phone Mfg.
Goldak Co.
Wilder, R. S.

FIRE CONTROL INSTRUMENTS, MILITARY & NAVAL
Abrams Instrument
Aero Electronics
Airborne Instrument Lab.
AiResearch Mfg.
American Electronic Mfg.
American Hydromath
American Optical
Arma Corporation
Austin Co.
Avion Div.
Bausch & Lomb
Bell & Howell Co.
Belock Inst. Co.
Bendix Aviation Corp.
Betts & Betts



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Condensifilter

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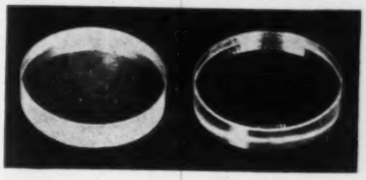

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Cal-Tronics Corp.
Control Engineering
Daca Machine & Tool
Daystrom Inst.
Edcliff Instrments
Elec. Indicator Co.
Electro-Snap Switch
Electronic Associates
Farrand Optical
Fecker, J. W.
Ford Instrument
Gaertner Scientific
Garlynn Engrg. Co.
General Elec. Co.
Gurley, W. & L. E.
Helio Instrument
H-B Instrument
Industrial Control Co.
Instrument Dev. Lab.
International Dev. Co.
Jerpbak-Bayless Co.
Kollmorgen Optical Co.
Librascope
Magnetic Industries
Mahn Co., W. I.
Martin-Hubbard Corp.
Maxson Corp.
Meyer & Co., Hugo
Moog Valve
Nalley, Leonard L.
Norden-Ketay Corp.
North American Insts.
Opplem Co., Inc.
Perkin-Elmer Corp.
Phila. Scientific Glass.
RCA Div.
Reeves Instrument
Robinette Co., W. C.
Servomechanisms Inc.
Servo-Tek Products
Simmonds Aerocessories
Sperry Gyroscope Co.
Sterling Precision Insts.
Summers Gyroscope
Taller & Cooper, Inc.
Unertl Optical Co.
Vectron, Inc.
Wiancko Engineering
Wollensak Optical

FLASH POINT TESTERS
(See Tester, Flash Point)

FLASHERS
Neon Tube

Amglo Corp.
Chatham Electronics
E-T-A Products
Pacific Transducers
Thordarson-Meissner

FLATS, OPTICAL

Ace Glass Inc.
Acme Industrial Co.
Acme Scientific
Align-A-Scope Inc.
American Lens
American Optical
Baird Associates
Bausch & Lomb Optical
Binswanger & Co.
Bray Optical
Burke & James Inc.
Cal-Astro Optical
Central Scientific Co.
Clark & Sons
Crane Packing
Crystal Research Labs.
Curtiss Labs.
Davidson Mfg.
Dearborn Scientific
DoAll Co.
Eastman Kodak Co.
Edmund Scientific
Ednal Co.
Electro-Physics
Engis Equipment
Ercona Corp.
E & S Optical
E & W Optical
Fecker, Inc.
Ferner Co.
Fish-Schurman Co.
Fosdick Glass Co.
Fuess Inc.
Gaertner Scientific Corp.
General Scientific Corp.
Georator Corp.
Glendale Optical
Goerz Amer. Optical Co.
Gordon Enterprises
Griswold Mfg. Co.
Gurley, W. & L. E.
Hausser & Son
Hayward Scientific Glass
Helio Instrument
Henson Co., Fred C.
Herron Optical
Howland Optical Works
Houston Technical Labs.
International Dev. Co.
Jarrell-Ash Co.
Jones Optical Works
Kollmorgen Optical Co.
Lancaster Lens Co.
Laboratory Optical
Leitz, Inc.
Mann. Co., Wm. I.
Master Optical Co.
Mico Instrument Co.
Miller Corp., William
Nife Inc.
Optron Laboratory
Pacific Optical
Pancro Mirrors
Penn Optical & Inst.
Perkin-Elmer Corp.
Phoenix Prec. Inst.
Plummer & Kershaw
Pratt & Whitney
Quartz Products
Republic Lens
Scherr Co., Inc., George
Sheffield Corp.
Schneider-Cogswell
Schutte Optical
Simpson Optical
Surface Finishes Inc.
Tinsley Laboratories
Topp Industries, Inc.
Unertl Optical Co.
Univis Lens Co.
Van Keuren Co.
Vinco Corp.
Webber Gage Co.
Wilder, R. S.
Wollensak Optical Co.
Zeiss, Inc., Carl
Zenith Optical Co.
Zoomar Corp.

FLATS, OPTICAL, Fused Quartz

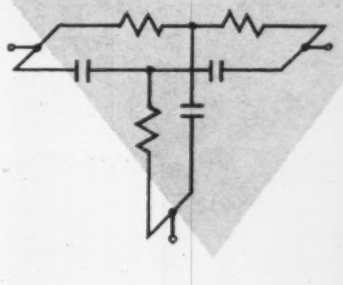
Acme Industrial
Acme Scientific
Align-A-Scope Inc.
American Lens
American Optical
Bray Optical Co.
Bausch & Lomb Opt.
Cal-Astro Optical Labs.
Cooper-Hewitt Elec.
Crane Packing
Crystal Research Labs.
Dearborn Scientific
DoAll Co.
Engis Equipment
E & S Optical
E & W Optical Co.
Fecker, Inc.
Fish-Schurman Corp.
Fosdick Glass Co.
Gaertner Scientific
Georator Corp.
Gordan Enterprises
Griswold Mfg. Co.
Hanovia Chem. & Mfg. Co.
Helio Instrument
Henson Co., Fred C.
Howland Optical Co.
International Dev. Co.
Jarrell-Ash Co.
Jones Optical Works
Laboratory Optical
Lancaster Lens Co.
Mann Co., W. I.
Neider Fused Quartz Co.
Nife Inc.
Opplem Co., Inc.
Optron Laboratory
Perkin-Elmer Corp.
Phoenix Prec. Inst.
Plummer & Kershaw
Quartz Products
Scherr Co., Inc.
Schneider-Cogswell
Schutte Optical
Sheffield Corp.
Simpson Optical Mfg.
Surface Finishes Inc.
Thermal American Fused
Thermal Syndicate Ltd.
Tinsley Laboratories
Unertl Optical Co.
Van Keuren Co
Webber Gage Co.
Zenith Optical Labs.

FLIGHT DIRECTION INDICATORS

Aero Electronics
Airborne Instruments Lab.
Bendix Aviation Corp.
Daystrom Inst.
Eclipse-Pioneer Div.
Electro-Mec. Lab.
Ford Instrument
Genisco Inc.
Instr. Associates
Jarvis Electronics
Kearfott Co.
Kollsman Instrument
Marion Elec. Inst.
Norden-Ketay Corp.
Specialties, Inc.
Sperry Gyroscope Co.
Stafford Co.
Summers Gyroscope Co.
Topp Industries Inc.
Weston Elec. Inst.

FLIGHT TEST INSTRUMENTS

Aero Electronics
Aero Research
Airborne Instruments
Applied Science Corp.
Arnoux Corp.
Avion Div.
Barton Instrument
Bendix Aviation Co.
Brooks Rotameter Co.
Brush Electronics Co.
Burton Mfg.
Cal-Tronics Corp.
Colvin Labs.
Commercial Research
Consolidated Engg. Corp.
Datran Engg.
Davies Labs.
Donner Scientific
Electronic Associates
El Mec Labs.
Epsco, Inc.
Federal Telegraph Co.
Fischer & Porter
Ford Instrument
General Devices Inc.
General Electric Co.
General Mills Inc.
Genisco, Inc.
Giannini & Co.
Hamilton Watch Co.
Hastings Inst. Co.
Hathaway Instrument
Heiland Div.



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Lewis Engineering
Marion Elec. Inst.
Matisa Equipment
M. B. Mfg. Co.
Meriam Instrument Co.
North American Instruments
Pacific Scientific
Penn Ind. Inst. Corp.
Potter Aeronautical
Rahm Inst., Inc.
Revere Corp.
Scientific Enterprises
Sensitive Research Inst.
Sperry Gyroscope Co.
Statham Labs.
Summer Gyroscope Co.
Televiso Products
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Topp Industries, Inc.
Wallace & Tiernan
Wianko Engineering
Wollensak Optical Co.

"FLOW"

(Flowmeters measure primarily RATE of flow. For positive or "quantity" fluid meters, see the numerous classes under "Meters")

FLOWMETERS, AIR
(See Flowmeters, Gas)

FLOWMETERS, AREA
Cone & Disk Type

Commercial Research
Fischer & Porter
Friez Instruments Div.
Hallikainen Instruments
Hays Corp.
Jacoby-Tarbox
National Meter Co.
Penn. Ind. Inst. Div.
Phoenix Precision Inst.
Precision Scientific Co.
Taylor Inst. Cos.

FLOWMETERS, AREA
Cylinder & Piston Type

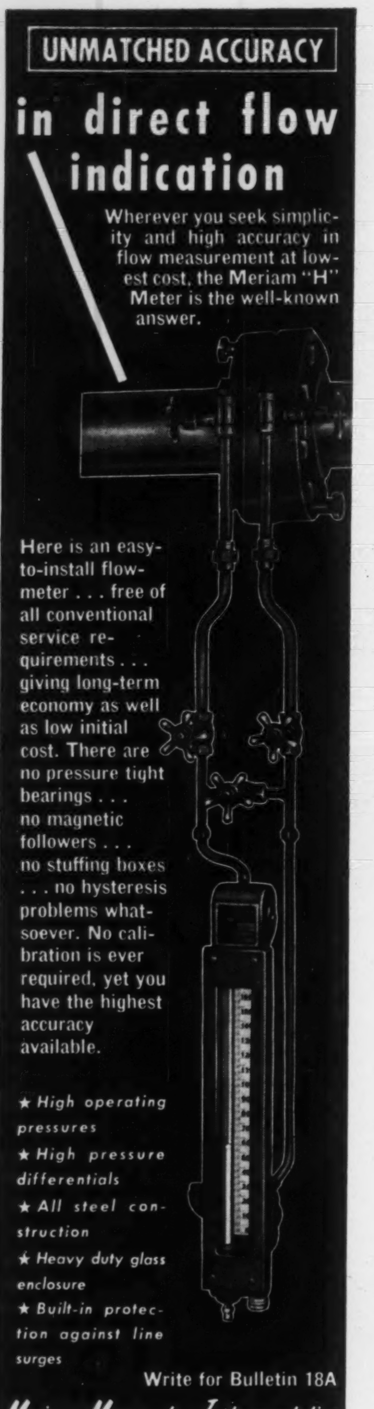
American Inst. Co.
Bowser Inc.
Fischer & Porter
Hallikainen Instruments
Hays Corp.
Minneapolis-Honeywell
National Meter Co.
New Jersey Meter Co.
Penn Ind. Inst. Corp.
Phoenix Precision Inst.
Precision Scientific Co.

FLOWMETERS, AREA,
Free Float Type

American Gas Furnace Co.
Bellco Glass
Bristol Co.
Brooks Rotameter
Commercial Research
Dwyer Mfg. Co.
Fischer & Porter
Fish-Schurman Corp.
Greiner Glassblowing Lab.
Hallikainen Instruments
Hammel-Dahl Co.
Hays Corp.
Hoke, Inc.
Jacoby-Tarbox Corp.
King Engng.
Mercury Glass Co.
Penn. Ind. Inst. Div.
Phoenix Prec. Inst.
Podbeilniak, Inc.
Precision Scientific Co.
Schutte & Koerting Co.
Sticht Co.
Taylor Inst. Cos.
Technical Equipment Co.
Waukee Engineering

FLOWMETERS, AREA
Orifice & Plug Type

American Meter Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Instrument
Bristol Co.
Brooks Rotameter Co.
Builders-Providence, Inc.
Fischer & Porter
Greiner Glassblowing Labs.
Hagan Corp.
Hallikainen Instruments
Hastings Inst. Co.
Hays Corp.
Henszey Co.
Industrial Inst. Corp.
Mason-Neilan Regulator
Meriam Inst. Co.
Minneapolis-Honeywell
Precision Scientific Co.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- ★ High pressure differentials
- ★ All steel construction
- ★ Heavy duty glass enclosure
- ★ Built-in protection against line surges

Write for Bulletin 18A

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Simplex Valve & Meter
Taylor Inst. Cos.
Trimount Instrument

FLOWMETERS, BLAST
(See Flowmeters, Gas)

FLOWMETERS, ELECTROMAGNETIC
Berkeley Scientific Div.
Fischer & Porter
Foxboro Co.
G E Instrument Dept.
Hydraulic Controls Co.
Instr. Associates
Penn Ind. Inst. Div.
Potter Aeronautical
Revere Corp.
Sangamo Electric
Technical Equipment Co.
Waugh Engineering

FLOWMETERS, GAS
Ace Glass, Inc.
Aero Research
AiResearch Mfg.
American Gas Furnace Co.
American Inst. Co.
American Meas. Insts.
American Meter Co.
Askania Regulator Co.
Automatic Temp. Cont.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Corp.
Berkeley Scientific Div.
Bowser Inc.
Bristol Co.
Brooks Rotameter
Builders-Providence
Commercial Research
Cook Electric
Corning Glass Works
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Electric Heat Control
Elec. Indicator Corp.
Engelhard, Charles
Enges Equipment
Engr. Research & Dev.
Erdco Engrg. Co. Inc.
Fischer & Porter
Fish-Schurman Co.
Flow Corp.
Foster Engg.
Foxboro Co.
Friez Instrument Div.
Gas Appliance Specialties
General Elec. Co.
Giannini & Co.
Greiner Glassblowing Lab.
Gulton Mfg. Co.
Hagan Corp.
Hastings Inst. Co.
Hays Corp.
Henszey Co.
Hermetic Sealing Corp.
Hoke, Inc.
Illinois Testing Labs.
Industrial Inst. Corp.
Instr. Associates
International Filter Co.
Jacoby-Tarbox
King Engg. Corp.
Kollsman Inst. Div.
Laboratory Equip. Corp.
Leeds & Northrup
Leupold & Stevens
Linde Air Products
Manning, Maxwell & Moore
Mason-Neilan Regulator
Maxson Corp.
Meriam Co.
Minneapolis-Honeywell
Moore Products
National Inst. Labs.
National Meter Co.
New Jersey Meter Co.
Norden-Ketay Corp.
Northwest Instrument
Penn Ind. Inst. Div.
Phoenix Prec. Inst.
Pitometer Log Corp.
Podbielniak, Inc.
Precision Scientific
Ramapo Engr. Co.
Refinery Supply Co.
Republic Flow Meters
Revere Corp.
Rotron Controls
Schutte & Koerting Co.
Scientific Glass Apparatus
Selas Corp. of America
Sheffield Corp.
Simplex Valve & Meter
Southwestern Indus. Elect.
Statham Labs.
Superior Meter Co.
Swartwout Co.
Taylor Inst. Cos.
Technical Equipment Co.
Trimount Instrument
U. S. Gauge
Victory Engr.
Vitro Corp.
Waugh Engineering
Waukee Engineering
Weston Elec. Inst.

FLOWMETERS, LIQUID
(See Flowmeters, Gas)

FLOWMETERS, Open-Stream
Bailey Meter Co.
Bristol Co.
Builders-Providence
Foxboro Co.
G. M. Mfg. Co.
Gurley, W. & L. E.
Hagan Corp.
Hays Corp.
Leupold & Stevens
Mason-Neilan Regulator
Minneapolis-Honeywell
Penn Ind. Inst. Div.
Republic Flow Meters
Scientific Inst. Co. Calif.
Simplex Valve & Meter
Victory Engr.
Westberg. Mfg. Co.
White Co.

FLOWMETERS, Orifice, and Nozzle
Ace Glass, Inc.
AiResearch Mfg.
American Meter Co.
Askania Regulator Co.
Automatic Temp. Control
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Corp.
Bristol Co.
Builders-Providence
Campbell Co., J. A.
Commercial Iron Works
Corning Glass Works
Daniel Orifice Fitting
Fischer & Porter
Foxboro Co.
Greiner Glassblowing Lab.
Hagan Corp.
Hays Corp.
Hoke, Inc.
Hydraulic Controls Co.
Industrial Inst. Corp.
Leeds & Northrup Co.
Leupold & Stevens
Manning, Maxwell & Moore
Mason-Neilan Regulator
Meriam Instrument
Minneapolis-Honeywell
Moore Products
National Inst. Labs.
Penn Ind. Inst. Dev.
Permutit Co.
Refinery Supply Co.
Republic Flow Meters
Robinson Orifice
Schutte & Koerting Co.
Scientific Glass Apparatus
Scientific Inst. Co.
Simplex Valve & Meter
Taylor Inst. Cos.
Trimount Instrument
Turner Electric Co.
Weston Elec. Inst.

FLOWMETERS, Pitot Tube
Aero Research
Airflo Instrument
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Askania Regulator Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Braun Corp.
Bristol Co.
Cambridge Inst. Co.
Central Scientific Co.
Custom Scientific Insts.
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Ellison Draft Gage Co.
Flow Corp.
Foxboro Co.
Friez Instrument
Hagan Corp.
Hays Corp.
Hill & Co., E. Vernon
Illinois Testing Labs.
Industrial Inst. Corp.
Kollsman Inst. Div.
Leupold & Stevens
Manning, Maxwell & Moore
Mason-Neilan Regulator Co.
Meriam Instrument
Minneapolis-Honeywell
Moore Products Co.
Penn Ind. Inst. Div.
Pitometer Log Corp.
Precision Therm. & Inst.
Precision Tube Co.
Refinery Supply Co.
Republic Flow Meters
Revere Corp.
Simplex Valve & Meter
Taylor Inst. Cos.
Trimount Instrument

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Barton Inst. Corp.
Bristol Co.
Brooks Rotameter Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
Hagan Corp.
Hays Corp.
King Engng.
Industrial Inst. Corp.
Leeds & Northrup Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Meriam Inst. Co.
Minneapolis-Honeywell
Moore Products
Penn Ind. Inst. Div.
Republic Flow Meters
Simplex Valve & Meter
Taylor Inst. Cos.
Trimount Inst.
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Eclipse-Pioneer Div.
Friez Inst. Div.
Hays Corp.
Illinois Testing Labs.
Industrial Inst. Corp.
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BAILEY METER COMPANY
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Bailey Meter Company Ltd., Montreal, Canada

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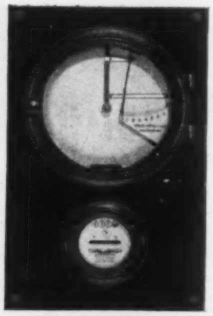

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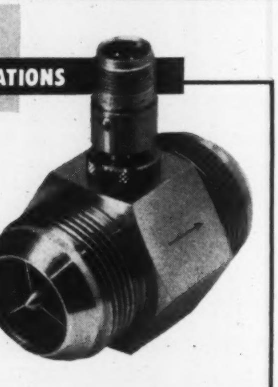

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Leupold & Stevens
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Fischer & Porter
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Gurley, W. & L. E.
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FLUID METERS, GAS (See Gas Meters)

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Universal X-Ray Prods.
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Pacific Tranducer
Phoenix Precision Inst.
Rawson Electrical Inst.
Rese Engineering
Rubicon Co.
Sensitive Research Inst.
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Gaertner Scientific
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Hathaway Instrument
Heiland Div.
McShan Dev. Co.
Miller Instruments
Philamon Labs.
Riverbank Labs.
Stoelting Co., C. H.
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Varo Mfg. Co.
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Riverbank Laboratories
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Macalaster Bicknell
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Phoenix Precision Insts.
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Sorvall Inc., Ivon
Technical Equipment Co.
Todd Scientific Co.
Uhrig Co., Joseph F.
Wakefield Industries

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Minnesota Electronics
Potter Aeronautical
Servo Corp. of America
Stewart Instrument
Varo Mfg. Co.

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Berkeley Scientific Div.
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Detectron Co.
Diatron Co.
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Hewlett Packard Co.
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Jersey City Tech. Lab.
Knights Co.
Lampkin Lab.
Lavoie Laboratories
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Marconi Instruments
M B Mfg. Co.
Metron Instrument
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Millen Mfg. Co.
Minnesota Electronics
New London Inst. Co.
North American Insts.
Polytechnic Res. & Dev.
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Potter Instruments
Radiation Instrument
Radio Frequency Labs.
Ramapo Engg.
RCA Div.
Reiner Electronics
Rowe Radio Research
Servo Corp. of America
Shasta Div.
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Simpson Electric
Standard Elec. Time
Stewart Instrument
Sunshine Scientific
Thordarson-Meissner
United Optical Co.
Varo Mfg. Co.
Virginia Electronics
Walkirt Co.
Wang Laboratories
Waugh Engineering
West Coast Electronics
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Conn Ltd.
Daven Co.
Electro-Tech Equip.
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General Radio Co.
Hastings Inst. Corp.
Hathaway Instrument
Hickok Elec. Inst. Co.
Hormell Instrument Co.
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Kellogg Switchboard
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Potter Instrument
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Servo Corp. of America
Shasta Div.
Simpson Electric
Sperry Gyroscope Co.
Standard Elec. Time
Thordarson Elec. Mfg..
Triplett Elec. Inst.
United Optical Mfg.
Varo Mfg. Co.
Walkirt Co.
Waugh Engrg.
Westberg Mfg. Co.
West Coast Electronics
Westinghouse Elec.
Weston Elec. Inst. Corp.
Westport Electric

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Berkeley Scientific Div.
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Linear Equipment
Marconi Instruments
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Mico Instrument
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Narda Corp.
Polytechnic Res. & Dev.
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Sylvania Elec. Prod.
Thompson Products
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FREQUENCY METERS, Recording

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Epic, Inc.
Esterline-Angus Co.
Federal Telephone
GE Apparatus Sales
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Metrotype Corp.
Minnesota Electronics
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Shasta Div.
Sheffield Corp.
Sound Apparatus
Telechron Dept.
Varo Mfg. Co.
Waugh Eng'ng.
West Coast Electronics
Westinghouse Elec.

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Aero Instrument
American Time Prods.
ARF Products
Berkeley Scientific Div.
Bliley Electric Co.
Browning Labs.
Central Scientific
Columbus Products Corp.
Crystal Research Labs.
Doolittle Radio
D & R Limited
Electronic Dev. Lab.
Federal Telephone
Feiler Engineering
Ferris Inst. Corp.
GE Instrument Dept.
General Radio Co.
Gertsch Products
Hathaway Instrument
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Hickok Elec. Inst. Co.
Industrial Test Equip.
Jacobs Instruments
Kinetic Instrument
Knights Co.
Lampkin Labs.
Lavoie Laboratories
Marconi Instruments
Millen Mfg. Co.
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Philamon Labs.
Polytechnic Res. & Dev.
Potter Instrument
Radioactive Products
Servo Corp. of America
Standard Elec. Time
Stewart Instrument
Sunshine Scientific
Varo Mfg. Co.
Westport Electric

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Biddle Co., Jas. G.
Browning Labs.
Epic, Inc.
Furst Electronics
J-B-T Insts., Inc.
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Marconi Instruments
Potter Instrument
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Commercial Research
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Eclipse-Pioneer Div.
Engineering Res. & Dev.
Fischer & Porter
Foxboro Co.
GE Instrument Dept.
Hagan Corp.
Hastings Inst. Co.
Hays Corp.
Mason-Neilan Regulator
Meriam Instrument Co.
Metrotype Corp.
Minneapolis-Honeywell
National Airoil Burner
Norden-Ketay Corp.
Oster Mfg., John
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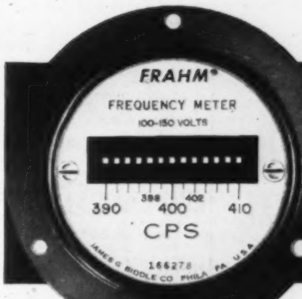

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.... applicable to pulsating or interrupted D-C as well as A-C supply circuits

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B-523

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For more information circle **148** on inquiry card.

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L and L Mfg
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Lucifer Electronic Furnaces
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Marshall Co., L. H.
Modern Electrical Lab.
Pacific Scientific
Precision Scientific
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Sargent & Co., E. H.
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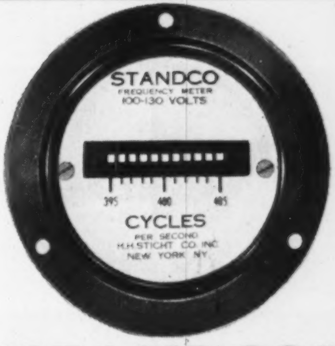
Laboratory Const. Co.
Laboratory Equipment



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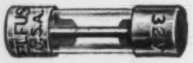

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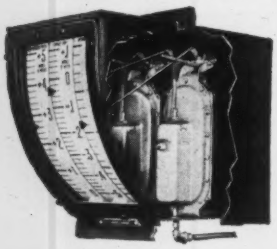

BAILEY MULTI-POINTER GAGES

● Bailey Multi-Pointer Gages are made with any number of pointers and any scale combination from one to twelve. The pointers have 10" motion over plainly marked plastic molded scales so that readings can be taken at a distance of 20 feet. Diaphragm actuated elements enable this gage to withstand over-drafts and over-pressures without injury to the unit or its calibration.

All secondary factors such as draft, pressure, temperature, stoker speed and pulverizer feed can be indicated on one Bailey Multi-Pointer Gage.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O
Bailey Meter Company Ltd., Montreal, Canada

For more information circle **151** on inquiry card.

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Lennard & Co.
Metalab Equipment
Moline Furniture Works
Peterson & Co., Inc.
Sheldon & Co.
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Dearborn Gage Co.
Dearborn Scientific
DoAll Co.
Engis Equipment
Ercona Corp.
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Van Keuren Co.
Webber Gage Co.

GAGE BLOCKS, Angle
DoAll Co.
Engis Equipment
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Swedish Gage Co.
Taper Micrometer
Webber Gage Co.

GAGE BLOCKS, Surface Finish
Surface Checking Gage

GAGE COCKS
Associated Valve & Engr.
Crosby Steam Gage & Valve
Jerguson Gage & Valve
Keckley Co., O. C.
Manning, Maxwell & Moore
Marsh Corp.
Reliance Gauge Column
U. S. Gauge
Weatherhead

GAGE GLASS ILLUMINATORS
Bray Optical Co.
Jerguson Gage & Valve
National Co.
Penberthy Injector Co.
Reliance Gauge Column
Yanall-Waring

GAGE TESTERS, Deadweight
American Inst. Co.
Amthor Testing Inst. Co.
Ann Arbor Inst. Works
Coleman Inst. Co.
Crosby Steam Gage Co.
Custom Scientific
Darley Co., W. S.
Gordon Co., Claud S.
Grove Regulator
Instr. Associates
Manning, Maxwell & Moore
Mansfield & Green
Olsen Testing Machine
Precision Scientific
Refinery Supply Co.
Ruska Inst. Corp.
Testing Machines, Inc.
Trerice Co.

GAGE TESTERS, Fluid scale
Crosby Steam Gage Co.
Manning, Maxwell & Moore
Meriam Inst. Co.
Refinery Supply

GAGE TESTERS, Liquid-column
Ideal Lab. Tool
Manning, Maxwell & Moore
Meriam Inst. Co.
Miller Falls Co.
Pioneer Instrument
Refinery Supply
Trerice Co.
Wallace & Tiernan

GAGES (See Object of Measuring and Control)

GAGES, Absolute Pressure
Acme Gauge & Inst.
Aeromarine Inst. Co., Inc.
Automatic Temp. Control
Bailey Meter Co.
Barton Inst. Corp.
Berkeley Scientific Div.
Bristol Co.
Burton Mfg.
Cameron Iron Works
Consolidated Vacuum Corp.
Cook Electric
Crosby Steam Gage & Valve
Datran Engg.
Distillation Products
Eclipse-Pioneer Div.
Ellison Draft Gage Co.
Emery Co., A. H.
Fischer & Porter
Foxboro Co.
Fredericks Co., Geo.
General Elec. Co.
Giannini & Co.
Hastings Inst.
Hathaway Inst. Co.
Hays Corp.
Jerpbak-Bayless
King Engng.
Kollsman Inst.
Lufkin Rule
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Inst. Co.
Minneapolis-Honeywell
Moeller Instrument
Moore Products
North American Inst. Inc.
Penberthy Injector
Penn Ind. Inst. Corp.
Precision Thermometer
Rahm Inst., Inc.
Republic Flow Meters
Rochester Mfg. Co., Inc.
Rutico, Inc.
Scientific Glass App.
Scientific Inst. Co.
Servomechanisms, Inc.
Skaneateles Mfg. Co.
Statham Labs.
Taylor Inst. Cos.
Technical Equipment Co.
Trans-Sonics, Inc.
Trimount Inst. Co.
Uehling Instrument Co.
Ultradyne Eng'ng Labs. Inc.
United States Gauge
Wallace & Tiernan
Weksler Thermometer
Weston Elec. Inst. Corp.
Wiancko Engineering

GAGES, Adjustable Length
Acme Industrial
Aeromarine Inst. Co.
Daytronic Corp.
DoAll Co.
Federal Products Corp.
Foxboro Co.
Manning, Maxwell & Moore
Merz Engineering
Moore Products Co.
Myer Corp.
Nilsson Gage Co.
Pratt & Whitney
Rochester Mfg. Co., Inc.
Saart, Kraemer & Hanscom
Scherr Co., George
Sheffield Corp.
Size Control Co.
Standard Gage
Starrett Co., L. S.
Swedish Gage
Taft-Peirce
Woodworth Co.

GAGES, Air
Acme Gauge & Inst.
Aeromarine Inst. Co.
American Chain & Cable
American Meter Co.
Bailey Meter Co.
Bastian-Blessing Co.
Beacon Gage
Block Mfg. Co.
Bristol Co.
Builders-Providence
Crosby Steam Gage Co.
Daytran Engg.
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Electric Auto-Lite
Ellison Draft Gage
Federal Products
Fischer & Porter
Foxboro Co.
Friez Div.
Fulton Sylphon Div.
Hastings Instrument
Hays Corp.
Hill & Co., E. Vernon
Johnson Service
Lambert Meter Co., Inc.
Manning, Maxwell & Moore
Marsh Corp.
Marshalltown Mfg.
Mason-Neilan Regulator
Meriam Inst. Co.
Merz Engineering
Minneapolis-Honeywell
Moore Products
Pratt & Whitney
Rochester Mfg. Co.
Scovill Mfg. Co.
Seely Inst. Co.
Shallcross Controls
Sheffield Corp.
Statham Labs.
Stewart-Warner
Sturdy Tool & Gage
Taft-Peirce
Taylor Inst. Cos.
Trerice Co.
Trimount Inst. Co.
Uehling Inst. Co.
U. S. Gage
Wallace & Tiernan
Weksler Thermometer
Weston Elec. Inst.
Witt Gage Co.

GAGES, Air-gap
Federal Products
G E Apparatus Sales
Ideal Industries
Martindale Electric Co.
Sheffield Corp.

GAGES, Alarm
Acme Gauge & Inst.
Aeromarine Inst. Co.
American Chain & Cable
Authorized Mfrs. Serv.
Automatic Temp. Control
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Crosby Steam Gage Co.
Daytronic Corp.

You Get Even, No Glare
LOW COST LIGHTING
for Gages, Rotameters, etc.

with **JERGUSON**
Explosion-Proof
GAGE ILLUMINATORS

UNDERWRITERS' LABORATORIES APPROVED

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Offices in Major Cities
Jerguson Tress Gage & Valve Co., Ltd., London, Eng.
Pétrole Service, Paris, France

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USG

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When you specify USG you are assured of quality gauges engineered for enduring accuracy. Your assurance is USG's engineering skill and production know-how gained from more than 50 years of instrument manufacturing—plus, one of the most rigid quality control systems in the instrument industry.

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PRODUCTS OF UNITED STATES GAUGE: Ammeters • Air Volume Controls Absolute Pressure Gauges • Air-Brake Gauges • Altitude Gauges • Boiler Gauges • Chemical Gauges • Inspectors' Test Gauges • Marine Gauges • Precision Laboratory Gauges • Welding Gauges Aircraft Instruments • Flow Meters • Boiler Thermometers • Industrial Thermometers Mercury, Gas and Vapor Dial Thermometers • Voltmeters

UNITED STATES GAUGE, *Division* of American Machine and Metals, Inc., Sellersville, Penna.

For more information circle **153** on inquiry card.

Dwyer Mfg. Co.
Ellison Draft Gage Co.
Fischer & Porter
Foxboro Co.
Instruments Inc.
Jerguson Gage & Valve Co.
Magnetrol, Inc.
Manning, Maxwell & Moore
Marsh Corp.
Marshalltown Mfg.
Mason-Neilan Regulator
Meriam Instrument Co.
Minneapolis-Honeywell
Norden-Ketay
Petrometer Corp.
Photocon Research
Precision Therm. & Inst.
Rochester Mfg. Co.
Trerice Co.
Trimount Inst. Co.
Uehling Instrument
U. S. Gage
Weksler Thermometer
Wiancko Engineering

GAGES, Amplifying

Ames Co., B. C.
Brown & Sharpe
Cleveland Inst.
Comtor Corp.
Daytronic Corp.
Engineering Res. & Dev.
Federal Prod. Corp.
Griswold Mfg. Co.
Kahn & Co.
Merz Engineering
Moore Products Co.
Poole Instruments
Pratt & Whitney
Precision Gage & Tool
Rutico, Inc.
Scherr Optical Tools
Sheffield Corp.
Statham Labs.
Swedish Gage

GAGES, Automatic Sorting

Arma Corporation
Cleveland Inst.
Daytronic Corp.
DoAll Co.
Electric Eye Equip.
Federal Products Corp.
Hathaway Instrument
Heyman Co.
Industrial Electronics
Industrial Gauge Corp.
Magnetic Gauge Co.
Martin-Hubbard Corp.
Merz Engineering
Moore Products Co.
Pratt & Whitney
Rockwell Engr.
Rowe Engineering
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Taft-Peirce
Swedish Gage

GAGES, Bore

American Instrument Co.
Brown & Sharpe
Commercial Research
Comtor Co.
Federal Prod. Corp.
Fielden Instrument
Industrial Prod. Div.
Jerpbak-Bayless Co.
Lufkin Rule Co.
Merz Engineering
Moore Products
Myer Corp.
Nilsson Gage Co.
Poole Instruments
Pratt & Whitney
Rimat Tool Co.
Scherr Co.
Sheffield Corp.
Size Control Co.
Standard Gage
Stocker & Yale
Swedish Gage
Taft-Peirce
U. S. Expansion Bolt
Vinco Corp.

GAGES, Bourdon

Acme Gauge & Inst.
American Chain & Cable
American Instrument
American Meter Co.
Autoclave Engrs.
Automatic Temp. Control
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bastian-Blessing Co.
Beacon Gage Co.
Bourns Labs.
Bristol Co.
Builders-Providence
Carver, Fred S.
Comtor Co.
Crosby Steam Gage
Dickson Co.
Electric Auto-Lite
Ellison Draft Gage
Emery Co., A. H.
Esterline-Angus
Fischer & Porter
Foxboro Co.
Giannini & Co., G. M.
Gordon Co., Claud S.
Gotham Inst. Div.
Hathaway Instrument
Hays Corp.
Heise Bourdon Tube
Hoke, Inc.
Kollsman Inst. Div.
Lonergon Co.
Manning, Maxwell & Moore
Marsh Corp.
Marshalltown Mfg.
Mason-Neilan Regulator
Mercoid Corp.
Miller Robinson Co.
Minneapolis-Honeywell
Norden-Ketay
Penn Ind. Inst. Corp.
Powers Regulator
Rahm Inst., Inc.
Republic Flow Meters
Rochester Mfg. Co.
Schaevitz Engg.
Servomechanisms, Inc.
Servonic Insts.
Sheffield Corp.
Sparling Meter Co.
Stewart-Warner
Taylor Inst. Cos.
Trerice Co.
United States Gauge
Weksler Thermometer
Welch Scientific
Wianko Engineering

GAGES, Caliper (Dial)

Amer. Measuring Insts.
Ames Co., B. C.
Brown & Sharpe
Chicago Dial Indicator Co.
Comtor Co.
DoAll Co.
Federal Prod. Corp.
Glogau & Co.
Lufkin Rule Co.
Marshall Co.
Myer Corp.
Nilsson Gage Co.
Pratt & Whitney
Premier Metal Etching Co.
Rimat Tool Co.
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Standard Gage Co., Inc.
Starrett Co.
Swedish Gage
Testing Machines, Inc.
Ti-Pi Co.
Waltham Dial Gage

GAGES, Center

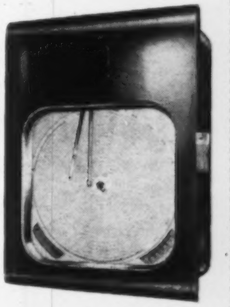
Brown & Sharpe
Bryant Chucking
DoAll Co.
Jerpbak-Bayless
Lufkin Rule
Miller Falls Co.
Scherr Co., Inc.
Size Control Co.
Sheffield Corp.
Starrett Co.

GAGES, Coating Thickness

American Inst. Co.
Ames Co., B. C.
Applied Research Labs.
Automatic Temp. Control
Branson Instruments
Curtiss-Wright
Daytronic Corp.
Dice Co., J. W.
Electronic Control
Gardner Laboratory
G E Apparatus Sales
Industrial Gauges Corp.
Industrial Nucleonics
Kocour Co.
Koehler Instrument
Krouse Testing
Mann Co.
Ohmart Corp.
Pratt & Whitney
Radioactive Products
R-C Scientific
Sheffield Corp.
Standard Electronic
Sunshine Scientific
Testing Machines Inc.
Thwing-Albert Instrument
Tracerlab, Inc.
Viking Instruments, Inc.

GAGES, Comparator

Amer. Measuring Insts.
Ames Co., B. C.
Automatic Temp. Control
Bristol Co.
Brown & Sharpe
Chicago Dial Indicator Co.
Cleveland Inst.
Commercial Research
Compar Inst. Co.
Comtor Co.
Decker Aviation
DoAll Co.
Eitzen Co.
Engineers Specialty Div.
Ercona Corp.
Federal Prod. Co.
Ferner Co.
General Elec. Co.
Industrial Electronics
Industrial Gauges Corp.
Jerpbak-Bayless Co.
Johnson Gage Co.
Jones & Lamson Machine
Link Engg. & Mfg.
Lufkin Rule Co.
Merz Engineering
Metron Instrument
Moore Products
Myer Corp.



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These easy-to-use, easy-to-service instruments are highly accurate and extremely stable in all ranges of application.

Write for Bulletins G620 and G621.

BRISTOL COMPANY

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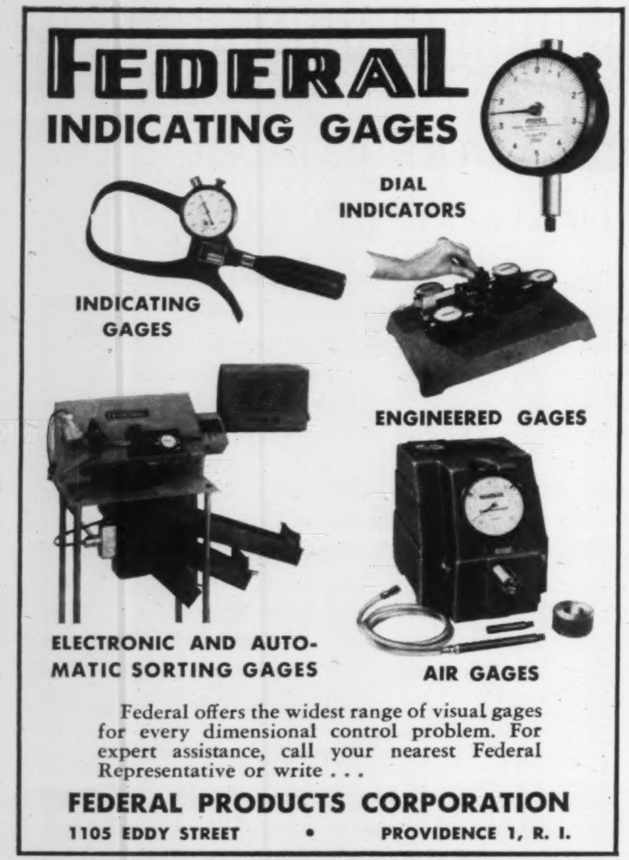

FEDERAL
INDICATING GAGES
DIAL INDICATORS
INDICATING GAGES
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For more information circle **155** on inquiry card.

Rule Out Guesswork!

Portable and stationary Inclined and Vertical Draft Gages. Level and tube replaceable in field. Constant zero. Bulletin 109.

Air Filter Gages for measuring resistance in air conditioning ducts. Bulletin 114.

Be Sure with ELLISON Instruments

Pitot Tubes for air and gas flow measurements. Angle and straight stem types, brass for temperatures to 500°F., stainless steel for temperatures to 1000°F. Bulletin 109.

PORTABLE GAS ANALYZERS Accurate, easy to use Combustion Testing Set equipped for analysis of CO_2, O_2 and CO, complete with flue gas thermometer. Bulletin 120.

ELLISON DRAFT GAGE CO.
550 W. MONROE BLDG. Since 1896 CHICAGO 6, ILL.

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For more information circle **156** on inquiry card.

Nilsson Gage Co.
Optical Gaging Prods.
Poole Instrument
Portman Instrument
Pratt & Whitney
Precision Gage & Tool
Saart, Kraemer & Hanscom
Scherr Co.
Sheffield Corp.
Size Control Co.
Standard Gage
Starrett Co., L. S.
Stocker & Yale
Sunshine Scientific
Surface Checking Gage
Swedish Gage
Waltham Dial Gage
Whittington Pump
Woodworth Co.

GAGES, Compression
Ann Arbor Inst. Works
Automatic Temp. Control
Bacharach Indus. Inst.
Baldwin-Lima-Hamilton
Chatillon & Sons
Control Devices Inc.
Daytronic Corp.
Dillon & Co., W. C.
Electric Auto-Lite
Gilmore Industries
Marsh Corp.
Olsen Testing Machine
Pratt & Whitney
Precision Scientific
Riehle Div.
Schauer Mfg. Co.
Sheffield Corp.
Statham Labs.
Testing Machines Inc.
Toledo Scale Co.
United States Gauge
Wiancko Engineering

GAGES, Concentricity
Arlin Products
Branson Instruments
Cleveland Inst.
Dearborn Gage Co.
DoAll Co.
Engis Equipment
Federal Products
Fielden Instrument
Griswold Mfg. Co.
Industrial Electronics
Industrial Gauges Corp.
Johnson Gage Co.
Moore Products Co.
Myer Corp.
Nilsson Gage Co.
Optical Gaging Prods.
Pratt & Whitney
Precision Gage & Tool
Rimat Tool Co.
Republic Gage Co.
Saart, Kraemer & Hanscom
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Standard Gage Co., Inc.
Stocker & Yale
Sturdy Tool & Gage
Swedish Gage Co.
Taft-Peirce
Whittington Pump

GAGES, Continuous Thickness
Aero Electronics
Applied Research Labs.
Branson Instruments
Bristol Co.
Curtiss-Wright
Daytronic Corp.
DoAll Co.
Electric Eye Equip.
Federal Prod. Corp.
Fielden Instrument
Foxboro Co.
G E Apparatus Sales
General Elec. X-Ray Corp.
Hathaway Instrument
Indus. Electronics (Mass.)
Industrial Electronics
Industrial Gauges Corp.
Industrial Nucleonics
Kahn & Co.
Lufkin Rule
Magnaflux Corp.
Magnetic Gauge Co.
Merz Engineering
Myer Corp.
Nuclear Research
Ohmart Corp.
Poole Manufacturing
Pratt & Whitney
Radioactive Products
R-C Scientific
Rockwell Eng'ng
Schaevitz Engg.
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Standard Electronics
Starrett Co.
Televiso Products
Testing Machines, Inc.
Ti-Pi Co.
Tracerlab Inc.
Viking Industries, Inc.
Waltham Dial Gage

GAGES, Continuous, Width
Aero Electronics
Automatic Temp. Control
Daytronic Corp.
DoAll Co.
Engineering Res. & Dev.
Federal Products Corp.
General Electric
Hathaway Instrument
Industrial Electronics
Merz Engineering
Myer Corp.
Pratt & Whitney
Sheffield Corp.
Size Control Co.
Standard Electronic

GAGES, Contour (see Gage, Profile)

GAGES, Cylinder
Ace Glass Inc.
Ames Co., B. C.
Arlin Products
Brown & Sharpe
Comtor Co.
Dearborn Gage Co.
DoAll Co.
Elgin National Watch
Federal Prod. Corp.
Lewis Engineering Co.
Lufkin Rule Co.
Merz Engineering
Moore Products Co.
Morse Co., H. E.
Myer Corp.
Nilsson Gage Co.
Poole Instruments
Pratt & Whitney
Precision Gage & Tool
Rimat Machine
Scherr Co., Inc.
Sheffield Corp.
Size Control Div.
Standard Gage
Starrett Co.
Swedish Gage

GAGES, Dead Weight
American Instrument
Ames Co., B. C.
Ann Arbor Inst. Works
Beacon Gage
Central Scientific
Coleman Inst.
Custom Scientific
Daytronic Corp.
Eastern Specialty
General Electric
Gilmore Instruments
Gordon Co., Claud S.
Grove Valve & Regulator
Instr. Associates
Link Engineering
Manning, Maxwell & Moore
Mansfield & Green
Marshalltown Mfg.
Myer Corp.
Refinery Supply Co.
Ruska Inst. Corp.
Size Control Co.
Swedish Gage Co.
Testing Machines, Inc.

GAGES, Depth, Linear
Alina Corp.
Amer. Measuring Insts.
Ames Co., B. C.
Ann Arbor Inst. Works
Brown & Sharpe
Builders-Providence
Carson Micrometer
Chicago Dial Indicator Co.
DoAll Co.
Federal Products Corp.
Fielden Instrument
Fischer & Porter
General Elec. Co.
Glogau & Co.
Jansson Gage Co.
Lufkin Rule Co.
Merz Engineering
Millers Falls
Myer Corp.
Nilsson Gage Co.
Park Sales
Petrometer Corp.
Pratt & Whitney
R & M Mfg. Co.
Ryan Tool & Engg.
Saart, Kraemer & Hanscom
Scherr & Co., Inc.
Servonic Insts.
Shand & Jurs Co.
Sheffield Corp.
Size Control Co.
Standard Gage
Starrett Co.
Stocker & Yale
Swedish Gage
Trimount Inst. Co.
U. S. Gauge Co.
Vapor Recovery System

GAGES, Depth, Navigational
Bendix Aviation Corp.
Brush Electronics Co.
Burton Mfg.
Crosby Steam Gage
Georator Corp.
G. M. Mfg. Co.
King Engineering Corp.
Manning, Maxwell & Moore
Negus, T. S. & J. D.
Raytheon Mfg. Co.
Uehling Inst. Co.
U. S. Gauge

GAGES, Dial, Machinists'
Alina Corp.
American Meas. Insts.
Ames Co., B. C.
Brown & Sharpe
Chicago Dial Indicator
Daytronic Corp.
DoAll Co.
Eitzen Co.
Federal Prod. Corp.
Ferner Co.
Gem Instrument
Genales, Andrew
Lufkin Rule Co.
Micro Master Co.
Myer Corp.
Nilsson Gage Co.
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Standard Gage
Starrett Co.
Swedish Gage Co.
Testing-Machines Inc.

GAGES, Differential Pressure
Aeromarine Inst. Co.
American Meter Co.
Automatic Temp. Control
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Beacon Gage Co.
Bendix Aviation Corp.
Bristol Co.
Builders-Providence
Burton Mfg.
Cleveland Fuel Equip.
Consolidated Vacuum Corp.
Crosby Steam Gage
Datran Engg.
Daytronic Corp.
Decker Aviation
Development Industries
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Ellison Draft Gage Co.
Emery Co. A. H.
Engineering Res. & Dev.
Foxboro Co.
Friez Instrument Div.
Gas Appliance Specialties
General Elec. Co.
Gilmore Industries
Gulton Mfg. Co.
Hagan Corp.
Hathaway Inst. Co.
Hays Corp.
Hebler Co.
Hill & Co., E. V.
Industrial Electronics
Industrial Inst. Corp.
Instr. Associates
King Engineering
Kollsman Inst.
Leupold & Stevens
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Instrument
Metron Instrument
Miller Robinson Co.
Minneapolis-Honeywell
Moeller Instrument
Moore Products Co.
National Inst. Labs.
Norden-Ketay Corp.
North American Insts. Inc.
Penn Ind. Inst. Div.
Perfex Controls Div.
Phoenix Precision Inst.
Pioneer Instrument
Pitometer Log Corp.
Precision Scientific
Precision Therm.
Preferred Utilities Mfg.
Rahm Inst., Inc.
Republic Flow Meters
Ruge-deForest, Inc.
Rutico, Inc.
Schaevitz Engg.
Scientific Enterprises
Scientific Glass Apparatus
Scientific Inst. Co.
Servomechanisms, Inc.
Sheffield Corp.
Simplex Valve & Meter
Statham Labs.
Taylor Inst. Cos.
Trans-Sonic, Inc.
Trerice Co., H. O.
Trimount Instrument
Uehling Instrument Co.
Ultradyne Eng'ng Labs. Inc.
U. S. Gauge
Victory Engr. Co.
Wallace & Tiernan
Weksler Thermometer
Weston Elec. Inst.
Whittington Pump
Wiancko Engineering

GAGES, Draft (See Gages, Differential Pressure)

GAGES, Drill Grinding
Brown & Sharpe
ConRay Corp.
Dearborn Gage Co.
Griswold Mfg. Co.
Lufkin Rule Co.
Starrett Co.

GAGES, Feeler
Acme Industrial
American Meas. Insts.
Brown & Sharpe
ConRay Corp.
Daytronic Corp.
Dearborn Gage Co.
DoAll Co.
Elgin National Watch
Engis Equipment
Lufkin Rule Co.
Millers Falls Co.
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Starrett Co.
Sturdy Tool & Gage
Swedish Gage
Van Keuren Co.
Vinco Corp.

GAGES, Flush Pin
Acme Industrial
Allen Gauge & Tool Co.
Amer. Measuring Insts.
Cadillac Gage Co.
ConRay Corp.
Dearborn Gage Co.
Elgin National Watch
Federal Products Corp.
Fonda Gage Co.
Jansson Gage Co.
Lawrence & Hill
Lufkin Rule Co.
Merz Engineering
Morse Co., H. E.
Nilsson Gage Co.
Precision Gage & Tool
Progressive Service Co.
Republic Gage Co.

Rimat Tool Co.
Saart, Kraemer & Hanscom
Sheffield Corp.
Size Control Co.
Standard Gage
Sturdy Tool & Gage
Swedish Gage
Taft-Peirce
Taper Micrometer
Vinco Corp.
Woodworth Co.
West & Dodge Thread

GAGES, Gas
Acme Gauge & Inst.
American Chain & Cable
American Meter Co.
Bailey Meter Co.
Bastian-Blessing
Builders-Providence, Inc.
Bristol Co.
Connelly Co.
Dickson Co.
Dwyer Mfg. Co.
Foxboro Co.
Gas Appliance Specialties
General Elec. Co.
Hays Corp.
Industrial Inst. Corp.
Linde Air Products
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Instrument
Minneapolis-Honeywell
Republic Flow Meters
Rochester Mfg. Co.
Specialty Glass Co.
Statham Labs.
Stewart-Warner
Superior Meter Co.
Taylor Inst. Cos.
Trimount Inst. Co.
Uehling Instrument
Waukee Engineering
Weksler Thermometer
Weston Elec. Inst.

GAGES, Grinding
Acme Industrial
American Meas. Insts.
Ames Co., B. C.
Brown & Sharpe
Comtor Co.
ConRay Corp.
Daytronic Corp.
Dearborn Gage Co.
Elgin National Watch
Engineering Res. & Dev.
Federal Prod. Corp.
Industrial Electronics
Industrial Gauges Corp.
Lufkin Rule Co.
Merz Engineering
Moore Products
Myer Corp.
Nilsson Gage Co.
Sheffield Corp.
Simpson Electric Co.
Size Control Co.
Swedish Gage Co.
Taft-Peirce
Taper Micrometer

GAGES, Grinding Finish
Compar Inst. Co.
Fielden Instrument
General Electric Co.
Industrial Electronics
Myer Corp.
Scherr Co., Inc.
Sheffield Corp.
Surface Checking Gage
Swedish Gage
Zeiss, Inc., Carl

GAGES, Height
Allen Gauge & Tool Co.
Amer. Measuring Insts.
Ashton Valve Co.
Bristol Co.
Brown & Sharpe
ConRay Corp.
Crosby Steam Gage & Valve
DoAll Co.
Federal Products Corp.
Fielden Instrument
Jansson Gage Co.
Leupold & Stevens
Lufkin Rule Co.
Marsh Corp.
Merz Engineering
Millers Falls Co.
Myers Corp.
Nilsson Gage Co.
Park Sales Co.
Pratt & Whitney
Ryan Tool & Engg.
Scherr Co.
Sheffield Corp.
Size Control Co.
Standard Gage
Starrett Co.
Stocker & Yale
Swedish Gage Co.
Vapor Recovery Systems
Weksler Thermometer

GAGES, Hook
Dwyer Mfg. Co.
Friez Instruments Div.
Garlynn Eng'ng Co.
Gurley, W. & L. E.
Leupold & Stevens
Lufkin Rule Co.
Meriam Inst. Co.
Premier Metal Etching Co.
Scientific Inst. (Calif.)
Sheffield Corp.
Starrett Co., L. S.
Swedish Gage Co.
Trimount Inst. Co.
White Co., Inc.

GAGES, Hydrostatic, (See Gages, Liquid Level Indicating)

GAGES, Internal Dial
Ames Co., B. C.
Brown & Sharpe
Byrant Chucking Grinder
Comtor Co.
DoAll Co.
Engis Equipment
Federal Products Corp.
Merz Engineering
Myers Corp.
Nilsson Mfg. Co.
Rimat Tool Co.
Scherr Co.
Sheffield Corp.
Size Control Co.
Standard Gage
Starrett Co., L. S.
Swedish Gage
Taper Micrometer

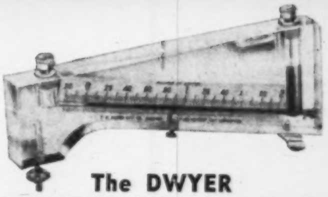
GAGES, Ionization
American Electronic Labs.
Anton Electronic Labs.
Central Scientific
ConRay Corp.
Consolidated Vacuum Corp.
Douglas Radio Labs.
Eitel-McCullough, Inc.
Electronic Products Co.
Forro Scientific
G E Apparatus Sales
Nucleonic Corp.
Process & Instruments
Radiation Counter Labs.
Radioactive Products Inc.
Scientific Specialties
Stoelting Co., C. H.
Tracerlab
Vacuum Tube

GAGES, Limit
Acme Industrial
Amer. Measuring Insts.
Arlin Products
Authorized Mfrs. Serv.
Brown & Sharpe
Daytronic Corp.
Dearborn Gage Co.
Detroit Tap & Tool
Federal Products Corp.
Fonda Gage
General Elec. Co.
Greenfield Tap & Die
Industrial Electronics
Industrial Gauges Corp.
Jansson Gage Co.
Johnson Gage Co.
Metron Instrument
Merz Engineering
Nilsson Gage Co.
Precision Gage & Tool
Pratt & Whitney
Scherr Co., Inc.
Sheffield Corp.
Simpson Electric Co.
Size Control Co.
Standard Gage
Sturdy Tool & Gage
Swedish Gage
Taft-Peirce
Van Keuren Co.
West & Dodge
Woodworth Co.

GAGES, Linear Measuring
Ann Arbor Inst. Wks.
Brown & Sharpe
Chicago Dial Indicator
Computer Instrument
Control Devices, Inc.
Daytronic Corp.
DoAll Co.
Donner Scientific
Electronic Control Systems
Engis Equipment
Ercona Corp.
Federal Products
Gaertner Scientific
General Cybernetics
Griswold Mfg. Co.
Gulton Mfg. Co.
Hillyer Inst.
Industrial Electronics
Lufkin Rule Co.
Minatron Corp.
Myer Corp.
Nilsson Gage Co.
North American Inst.
Pratt & Whitney
Premier Metal Etching
Saart, Kraemer & Hanscom
Schaevitz Engineering
Scherr Optical Tools
Scientific Enterprises
Sheffield Corp.
Size Control Co.
Starrett Co., L. S.
Statham Labs.
Stocker & Yale
Swedish Gage Co.
Taft-Peirce
United Engineers

GAGES, Liquid Level Indicating
Aeromarine Inst. Co., Inc.
American Chain & Cable
American Meter Co.
Ann Arbor Inst. Wks.
Anton Electronic Labs.
Assoc. Valve & Engrg.
Autocall Co.
Automatic Control Co.
Automatic Temp. Control
Aviation Engineering
Avien, Inc.
Bacharach Industrial Inst.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Barton Inst. Corp.
Bastian-Blessing
Bin-Dicator Co.
Bogue Mfg. Co.
Boston Auto Gage
Bowser & Co.
Bristol Co.
Builders-Providence
Bunnell Co., J. H.
B. W. Controller
Campbell Co., J. A.
Canadian Radium
Cincinnati Div.
Climax Div.
Control Corp.
Cook Electric
Crosby Steam Gage
Datran Engg.
Davis Reg. Co.
Diamond Power Specialty
Dickson Co.
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Electric Auto-Lite
Elec. Indicator Corp.
Electric Tachometer Corp.
Elematic Equip. Co.
Electronic Prod. Co.
Engineering Res. Assoc.
Fielden Instruments
Fischer & Porter
Fisher Governor Co.
Fisher Research Lab.
Foxboro Co.
Frick Co.
Friez Instrument Div.
Garlynn Eng'ng. Co.
General Controls Co.
GE Instrument Dept.
GE X-Ray Dept.
Gilbert & Barker Mfg. Co.
Gilmore Industries
Gorrell & Gorrell
Gotham Inst. Co.
Gray Instrument
Grove Valve & Regulator
Guardian Electric
Gurley, W. & L. E.
Hagan Corp.
Hammel-Dahl Co.
Hathaway Inst. Co.
Hawk Tool & Eng'ng.
Hays Corp.
Henry Valve Co.
Hill & Co., E. V.
Indus. Electronics (Mass.)
Industrial Inst. Corp.
Instrument Lab., Inc.
Jarco Services
Jerguson Gage & Valve
Jo-Bell Products
Johnston & Jennings
Keckley Mfg. Co.
Kellogg Switchboard
King Engineering
Leeds & Northrup Co.
Leupold & Stevens
Liquidepth Indicators
Liquidometer Co.
Liquid Scale Gauge Co.
Liquidivision Gauge
Lonergan Co., J. E.
Lufkin Rule Co.
Lumenite Elec. Co.
Magnetrol, Inc.
Manning, Maxwell & Moore
Marsh Corp.
Marshalltown Mfg.

SENSITIVE — DURABLE— ACCURATE



The DWYER
TRANSPARENT INCLINED GAGE
for
distinct readings of pressure differentials up to 3" water—drafts—air velocities—filter resistances.

The DWYER
MAGNEHELIC
GAGE
for
dial type reading of highly sensitive pressure differentials. 0" to .5" of water and 0 to 2 psi. Helical magnetic linkage sensitive to .00025" movement of magnet. Lifetime wear.

DWYER Specialized INSTRUMENTS and GAGES
F. W. Dwyer Mfg. Co.
P.O. BOX 373-X, MICHIGAN CITY, INDIANA
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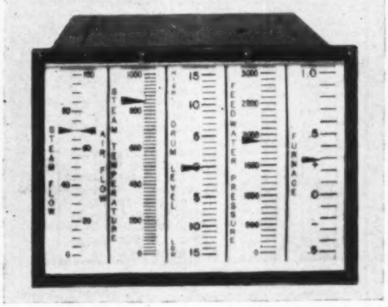


REPUBLIC
DRAFT GAGES

New V5 Series with 5-in. illuminated scales for measuring draft, pressure, gas differential, vacuum and temperature. May also be used as receiver for pneumatic transmitters.

Compact size saves space without sacrificing performance. Full sized diaphragms, bellows and helixes used for accuracy and sensitivity. Units may be mounted singly or in multiple case. Interchangeable, easily removed and replaced without disturbing others.

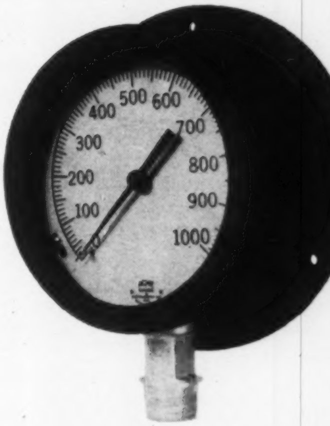
WRITE FOR BULLETIN 806

REPUBLIC FLOW METERS CO.
2240 Diversey Pkwy. Chicago 47, Ill.

REPUBLIC
INSTRUMENTS • CONTROLS

For more information circle **157** on inquiry card.

Acme Gauges



Custom built pressure gauges in all ranges from 15 to 30,000 psi, in dial sizes from 4½" to 12".

Write today for Bulletin 47

Acme Gauge & Instrument Co., Inc.
30 Main St. Brooklyn 1, N. Y.

For more information circle **159** on inquiry card.

HEISE GAUGES

Precision Built

For laboratory service
The scientifically
accurate pressure
measuring instrument

★ Permanent positive accuracy of alignment guaranteed by integral construction.
★ Weldless heat treated Bourdon tube maintains precise calibration.
★ Patented "External Bleeder"
★ Massive Bronze casting coordinates all working parts of the gauge

Pressure ranges 15 to 20,000 psi.
Sizes 8½", 12" and 16"
Prices from $151.60

CATALOG ON REQUEST

THE STANDARD OF THE WORLD

HEISE BOURDON TUBE COMPANY, INC.
BROOK ROAD, NEWTOWN, CONNECTICUT, U.S.A.

For more information circle **160** on inquiry card.

Mason-Neilan Regulator
McAlear Mfg.
McNeill Engineering
Meriam Instrument
Minneapolis-Honeywell
Mira Scientific Inst.
Moore Products
Mosher Electronic
Natural Gas Equipment
Norden-Ketay
Nuclear Research
NRD Instrument
Ohmart Corp.
Panalarm Products, Inc.
Panellit Corp.
Paragon Electric
Penberthy Injector Co.
Penn Ind. Inst. Div.
Photoswitch Div.
Pitometer Log Corp.
Pneumercator Co., Inc.
Precision Radiation
Precision Therm.
Preferred Utilities Mfg.
Radioactive Products
Rahm Inst. Inc.
R-C Scientific
Reliance Gauge Column
Republic Flow Meters
Republic Mfg. Co.
Revere Corp.
Rochester Mfg. Co.
Rockwell Engr.
Rosen Engg. Prods.
Schutte & Koerting Co.
Shand & Jurs Co.
Sheffield Corp.
Simmonds Aerocessories
Simplex Valve & Meter
Smith Corp., A. O.
Southwest Control
Standard Valves Inc.
Statham Labs.
Stewart-Warner
Taylor Inst. Cos.
Tracerlab, Inc.
Trerice Co.
Trimount Instrument
U C Indicator Sales
Uehling Instrument Co.
Ultradyne Eng'ng Labs. Inc.
United Control Corp.
United Engineers
U. S. Gauge
Vapor Recovery Systems
Victory Engg.
Viking Instruments
Virginia Electronics
Wallace & Tiernan
Water Level Controls
Weksler Thermometer
Warrick Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst.
Wiancko Engineering
Williams Gauge Co.
Yarnall-Waring Co.

GAGES, Liquid Level, Recording (See also Gages, Liquid Level, Indicating)

Bailey Meter Co.
Barton Inst. Co.
Boston Auto Gage
Bristol Co.
Builders-Providence
Crosby Steam Gage
Esterline-Angus
Foxboro Co.
Gilmore Industries
Grove Valve & Regulator
Gurley, W. & L. E.
International Filter Co.
Leupold & Stevens
Moore Products Co.
Penn Ind. Inst. Corp.
Radioactive Products
Republic Flow Meters
Simplex Valve & Meter
Taylor Inst. Cos.
Uehling Inst. Co.

GAGES, Loss of Head

Barton Inst. Co.
Bristol Co.
Builders-Providence, Inc.
Consolidated Vacuum Corp.
Foxboro Co.
Hagan Corp.
King Engineering Corp.
Manning, Maxwell & Moore
Meriam Inst. Co.
Penn Ind. Inst. Div.
Republic Flow Meters
Simplex Valve & Meter Co.
Trimount Inst. Co.
Uehling Inst. Co.

GAGES, Mercury

Ace Glass Inc.
Aeromarine Inst. Co., Inc.
American Meter Co.
Amthor Testing Mach.
Bacharach Industrial Inst.
Bailey Meter Co.
Barton Inst. Co.
Bristol Co.
Brown & Sharpe
Builders-Providence
Central Scientific
Connelly Co.
Consolidated Vacuum Corp.
Dwyer Mfg. Co.
Electronic Products
Ellison Draft Gage
G-M Mfg. Co.
Gas Appliance Specialties
General Elec. Co.
General Inst. Co.
Greiner Glassblowing Lab.
Hays Corp.
H-B Inst. Co., Inc.
Heise Bourdon Tube
Ideal Lab. Tool
Jerguson Gage & Valve Co.
King Engineering
Liquidepth Indicators
Machlett & Son
Manning, Maxwell & Moore
Mason-Neilan Regulator
Meriam Instrument
Minneapolis-Honeywell
Moeller Instrument
Precision Therm.
Refinery Supply Co.
Sargent & Co., E. H.
Scientific Glass Apparatus
Scientific Instrument
Simplex Valve & Meter
Speciality Glass Co.
Stoelting Co., C. H.
Taylor Inst. Cos.
Trerice Co.
Trimount Instrument
Uehling Instrument Co.
U. S. Gauge Co.
Universal X-Ray Prods.
Wallace Scientific
Wallace & Tiernan
Westinghouse Elec.
Weston Elec. Inst.

GAGES, Micrometer

American Meter Co.
Ames Co., B. C.
Amthor Testing Mach.
Bethlehem Apparatus Co.
Brown & Sharpe
Cadillac Gage Co.
Central Scientific Co.
Dice Co., J. W.
DoAll Co.
Eitzen Co.
Electro Products Labs.
Elgin National Watch
Engis Equipment
Ercona Corp.
Federal Products Corp.
Gaertner Scientific Corp.
Industrial Electronics
Industrial Gauges Corp.
Instrument Dev. Labs.
Jadow, Inc., B.
Lufkin Rule Co.
Miller Falls Co.
Poole Instrument
Pratt & Whitney
Precision Therm. & Inst.
Rimat Tool Co.
Scherr Co.
Sheffield Corp.
Size Control Co.
Slocomb Co.
Starrett Co.
Stocker & Yale
Swedish Gage
Testing Machines, Inc..
Ti-Pi Co.
Van Keuren Co.
Wilmotte, Inc.
Zeiss, Inc., Carl

GAGES, Oil (See Gages, Liquid Level)

GAGES, Optical

Acme Industrial
Acme Scientific Co.
American Instrument
Amer. Measuring Insts.
Ann Arbor Inst. Works
Bausch & Lomb
Clark & Sons
Compar Inst. Co.
Davidson Mfg.
Dixon Inc., William
DoAll Co.
Engineers Specialty Div.
Engis Equipment
Ercona Corp.
E & S Optical
E & W Optical Co.
Fecker, Inc.
Fish-Schurman Corp.
Gaertner Scientific Corp.
Griswold Mfg. Co.
Hyde Instrument
Instrument Dev. Labs.
Jarrell-Ash Co.
Jones & Lamson Machine
Mann Co., W. I.
Meyer & Co., Hugo
Nife, Inc.
Perkin-Elmer Corp.
Phoenix Prec. Inst.
Portman Instrument
Scherr Optical Tools
Schneider-Cogswell
Sheffield Corp.
Standard Electronic
Stocker & Yale
Swedish Gage Co.
Testa Mfg. Co.
Tinsley Laboratories
Zeiss, Inc., Carl

GAGES, Paint Film

American Inst. Co.
Ames Co., B. C.
Branson Instruments
Dice Co., J. W.
Electronic Control
Fielden Instrument
Gardner Laboratory
G E Apparatus Sales
Hathaway Inst. Co.
Koehler Inst. Co.
Krouse Testing
Metron Instrument
Munsell Color Co.
Ohmart Corp.
Radioactive Products
R-C Scientific
Standard Electronic

GAGES, Paper Thickness (See Gages, Thickness)

GAGES, Pipe

Federal Products Corp.
Greenfield Tap & Die
Pratt & Whitney
Republic Gage Co.
Sheffield Corp.
Simpson Electric Co.
Size Control Co.
Taft-Peirce
Three Point Industries

GAGES, Piston Ring

Amer. Measuring Insts.
Brown & Sharpe
Circle Gage Co.
DoAll Co.
Elgin National Watch
Federal Products Corp.
Hathaway Inst. Co.
Link Engineering
Merz Engineering
Moore Products Co.
Nilsson Gage Co.
Pratt & Whitney
Sheffield Corp.
Swedish Gage
Wilkening Mfg. Co.

GAGES, Pitch Diameter

Acme Industrial
Airborne Instruments
Brown & Sharpe
Bryant Chucking Grinder
Detroit Tap & Tool
DoAll Co.
Federal Prod. Corp.
Fonda Gage Co.
Gaertner Scientific
Greenfield Tap & Die
Jerpbak-Bayless Co.
Johnson Gage Co.
Kahn & Co.
Lufkin Rule Co.
Merz Engineering
Myer Corp.
Nilsson Gage Co.
Pratt & Whitney
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Starrett Co.
Stocker & Yale
Swedish Gage Co.
Union Tool Co.
Van Keuren Co.
Vinco Corp.
West & Dodge Thread
Woodworth Co.

GAGES, Plug

Acme Industrial
Amer. Measuring Insts.
Brown & Sharpe
Cadillac Gage Co.
Comtor Co.
Corning Glass Works
Dearborn Gage Co.
Deltronic Corp.
Detroit Tap & Tool
DoAll Co.
Eitzen Co.
Elgin National Watch
Federal Products Corp.
Fonda Gage
Greenfield Tap & Die
Jerpbak-Bayless Co.
Jessup Eng. & Dev.
Lawrence & Hill
Merz Engineering
Nilsson Gage Co.
Park Sales Co.
Pratt & Whitney
Precision Gage & Tool
Progressive Service Co.
R & M Mfg. Co.
Republic Gage Co.
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Standard Gage
Sturdy Tool & Gage
Swedish Gage
Taft-Peirce
Taper Micrometer
Van Kruenen Co.
Vinco Corp.
West & Dodge Thr. Gage
Woodworth Co.

GAGES, Pneumatic Tank

American Chain & Cable
Bacharach Industrial
Barton Inst. Co.
Bristol Co.
Designers for Industry
Fischer & Porter
Foxboro Co.
King Engineering
Liquidometer Corp.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Inst. Co.
Moore Products Co.
Pneumercator Co.
Rochester Co.
Uehling Inst. Co.
U. S. Gauge Co.

GAGES, Precision Measuring

Acme Industrial
Acme Scientific
Aero Electronics
Ames Co., B. C.
American Instrument Co.
Amer. Measuring Inst.
Ann Arbor Inst. Works
Arlin Products
Arma Corporation
Baldwin-Lima-Hamilton
Electronic Products Co.
Bethlehem Apparatus
Bristol Co.
Brown & Sharpe
Bryant Chucking Grinder
Cadillac Gage Co.
Cleveland Instrument
Comtor Co.
Custom Scientific
Datran Engg.
Daytronic Corp.
Dearborn Gage Co.
Decker Aviation
Dice Co., J. W.
DoAll Co.
Eitzen Co.
Elgin National Watch
Engis Equipment
Ercona Corp.
Federal Prod. Corp.
Ferner Co.
Fischer & Porter
Fonda Gage Co.
Gaertner Scientific
General Elec. Co.
Herman, Victor George
Industrial Electronics
Industrial Gauges Corp.
Jansson Gage Co.
Jerpbak-Bayless Co.
Johnson Gage Co.
Kahn & Co.
Lufkin Rule Co.
Magnetic Gauge Co.
Manning, Maxwell & Moore
Martin-Hubbard Corp.
Merz Engineering
Metron Instrument
Micrometrical Mfg.
Moore Products
Mueller Lab.
Myer Corp.
Nilsson Gage Co.
Nuclear Research
Perkin-Elmer Corp.
Phoenix Prec. Inst.
Poole Instruments
Portman Instrument
Pratt & Whitney
Precision Gage & Tool
Reliable Instrument
Rieker Instrument Co.
Rimat Tool Co.
Rockwell Engr.
Rutico, Inc.
Saart, Kraemer & Hanscom
Scherr Optical Tools
Sheffield Corp.
Simpson Electric Co.
Size Control Co.
Standard Gage
Starrett Co.
Stocker & Yale
Sturdy Tool & Gage
Swedish Gage
Taft-Peirce
Taper Micrometer
Testing Machines Inc.
Thwing-Albert Inst. Co.
Ti-Pi Co.
United Precision Prod.
Van Keuren Prod.
Victor Laboratory
Vinco Corp.
Wallace & Tiernan
Webber Gage Co.
Wilmotte, Inc.
Woodworth Co.
Wright Engineering Co.
Zeiss, Inc., Carl

GAGES, Pressure, Indicating

Ace Glass Inc.
ACME Gauge & Inst.
Aeromarine Inst. Co.
Aeroquip Corp.
American Chain & Cable
American Meter Co.
Ann Arbor Inst. Works
Atlantic Research
Autoclave Engrs.
Automatic Temp. Control
Aviation Engineering
Bacharach Industrial Inst.
Bailey Meter Co.
Baird Associates
Baldwin-Lima-Hamilton
Bastian-Blessing
Beacon Gage Co.
Berkeley Scientific Div.
Beta Corp.
Bethlehem Apparatus
Block Mfg. Co.
Boekel & Co.
Bristol Co.
Bryant Chucking Grinder
Builders-Providence
Burton Mfg.
Cameron Iron Works
Central Scientific Co.
Century Inst. Co.
Clark Blast Meter
Cleveland Fuel Equip.
Cole Inst. Co.
Coleman Inst. & Mfg.
Commercial Research.
Consolidated Engg.
Continental Elec. Co.
Consolidated Vacuum Corp.
Control Engineering
Crosby Steam Gage
Datran Engg.
Dayton-Rogers Mfg. Co.
Daytronic Corp.
Decker Aviation
Defender Inst. & Reg.
Designers for Industry
Diatron Co.
Dickson Co.
Dillon & Co., W. C.
Distillation Products
Douglas Radio Labs.
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Edcliff Instruments
Edison, Inc., Thomas A.
Electric Auto-Lite
Electro-Mec Lab.
Electro Products Labs.
Elematic Equip. Corp.
Ellison Draft Gage
Emery Co., A. H.
Endevco Corp.
Engineering Research & Dev.
Esterline-Angus Co.
Fischer & Porter
Fisher Scientific Co.

Foxboro Co.
Fredericks Co., George
Friez Instrument Div.
Fulton Sylphon Div.
Gas Appliance Specialties
GE Apparatus Sales
General Physical Lab.
Genisco, Inc.
Giannini & Co.
Gilmore Industries
Gordon Co., Claud S.
Gotham Inst. Div.
Gulton Mfg.
Hastings Inst. Co.
Hathaway Inst. Co.
Hays Corp.
Heise Bourdon Tube
Herman, Victor George
Hetts Associates
H & H Thermostats
High Vacuum Equip.
Hill & Co., E. V.
Hoke, Inc.
Industrial Electronics
Industrial Inst.
Jackson Co., Byron
King Engineering
Kollsman Inst.
Kontes Glass Co.
Logansport Machine
Lonergan Co.
Magnetic Gauge Co.
Manning, Maxwell & Moore
Mansfield & Green
Marsh Corp.
Marshalltown Mfg. Co.
Mason-Neilan Regulator
Massa Laboratories
Mercoid Corp.
Meriam Instrument
Metron Instrument
Micrometrical Mfg.
Miller Robinson Co.
Minneapolis-Honeywell
Moeller Instrument Co.
Moore Products
National Research
Norden-Ketay Corp.
Nurnberg Thermometer
Pacific Div.
Penn Ind. Inst. Corp.
Perfex Corp.
Photocon Research
Podbielniak, Inc.
Precision Gage & Tool
Precision Scientific
Precison Therm.
Preferred Utilities Mfg.
Process & Instruments
Rahm Inst., Inc.
Ramapo Engg.
RCA Div.
Refinery Supply Co.
Republic Flow Meters
Rochester Mfg. Co.
Ruge-deForest, Inc.
Rutico, Inc.
Sargent & Co., E. H.
Schauer Mfg. Co.
Scientific Glass App.
Scientific Inst. Co.
Scientific Specialties
Seely Inst. Co., Inc.
Servonic Insts., Inc.
Shallcross Controls
Sheffield Corp.
Skaneateles Mfg. Co.
Statham Labs.
Stewart-Warner Corp.
Stoelting Co., C. H.
Stokes Machine Co.
Sturdy Tool & Gage
Superior Meter Co.
Surface Combustion
Swedish Gage
Sylvania Elec. Prod.
Taylor Inst. Cos.
Technical Equipment Co.
Thwing-Albert Inst. Co.
Todd Scientific Co.
Trans-Sonics, Inc.
Trerice Co.
Trimount Instrument
Uehling Instrument Co.
United Instrument
U. S. Gauge
Universal X-Ray Prods.
Wagner & Son, Carl H.
Wallace & Tiernan (Low Pressure)
Weksler Thermometer
W. M. Welch Scientific Co.
Weston Elec. Inst.
Wiancko Engineering
Wilgus Manufacturing
Winslow Co.
Ultradyne Eng'ng Labs. Inc.

GAGES, Pressure—Recording (See Gages, Pressure, Indicating)

GAGES, Pressure Temperature (See Gages, Pressure Indicating)

GAGES, PRESSURE & TIRE

Schrader's Son
U. S. Gauge Co.

GAGES, Pressure & Vacuum (See Gages, Pressure Indicating)

GAGES, Profile

Acme Industrial
Amer. Measuring Insts.
Automatic Temp. Control
Brush Electronics
Cadillac Gage Co.
ConRay Corp.
Daytronic Corp.
Dearborn Gage Co.
Engineers Specialty Div.
Federal Products Corp.
Fielden Instrument
Fonda Gage
Foxboro Co.
General Elec. Co.
Industrial Electronics
Indus. Nucleonics
Jansson Gage Co.
Martin Hubbard Corp.
Merz Engineering
Micrometrical Mfg.
Moore Products Co.
Myer Corp.
Nilsson Gage Co.
Optical Gaging Prods.
Penn Optical & Inst.
Portman Instrument
Pratt & Whitney
Precision Gage & Tool
Scherr Co., Inc.
Sheffield Corp.
Size Control Div.
Standard Elec.
Stocker & Yale
Sturdy Tool & Gage
Swedish Gage Co.
Taft-Peirce
Vinco Corp.
Woodworth Co.

GAGES, Radius

Acme Industrial
American Meas. Insts.
Brown & Sharpe
Cadillac Gage Co.
ConRay Corp.
Dearborn Gage Co.
Federal Products Corp.
Fonda Gage Co.
Industrial Electronics
Lufkin Rule Co.
Mann Co.
Nilsson Gage Co.
Precision Gage & Tool
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Starrett Co.
Stocker & Yale
Sturdy Tool & Gage
Swedish Gage Co.
Taft-Peirce
Vinco Corp.
Wilmotte, Inc.
Woodworth Co.

GAGES, Rain (See Rain Gages)

GAGES, Rifle Bore

Baldwin-Lima-Hamilton
Comtor Co.
Federal Products Corp.
Fonda Gage Co.
Greenfield Tap & Die
Hathaway Inst. Co.
Moore Products
Myer Corp.
Nilsson Gage Co.
Poole Instruments
Portman Instrument
Pratt & Whitney
Rimat Tool Co.
Sheffield Corp.
Swedish Gage Co.
Vinco Corp.

GAGES, Ring

Acme Industrial
Allen Gauge & Tool Co.
Amer. Measuring Insts.
Brown & Sharpe
Bryant Chucking
Cadillac Gage Co.
Corning Glass Works
Dearborn Gage Co.
Detroit Tap & Tool
DoAll Co.
Elgin National Watch
Federal Products Corp.
Greenfield Tap & Die
Jessup Eng. & Dev.
Johnson Gage Co.
Lawrence & Hill
Merz Engineering
Morse Co., H. E.
Nilsson Gage Co.
Park Sales Co.
Pratt & Whitney
Precision Gage & Tool
Premier Metal Etching Co.
Republic Gage Co.
Sheffield Corp.
Simpson Electric Co.
Size Control Co.
Standard Gage
Sturdy Tool & Gage
Swedish Gage Co.
Taft-Peirce
Taper Micrometers
Vinco Corp.
West & Dodge Thread
Woodworth Co.
Worley Jewel Co.
Zeiss, Inc., Carl

GAGES, Screw Thread

Acme Industrial
Allen Gauge & Tool Co.
Brown & Sharpe
Bryant Chucking
Cadillac Gage Co.
Detroit Tap & Tool
DoAll Co.
Federal Prod. Corp.
Fonda Gage Co.
Greenfield Tap & Die
Jansson Gage Co.
Johnson Gage Co.
Kahn & Co.
Lufkin Rule Co.
Merz Engineering
Millers Falls Co.
Morse Co., H. E.
Myer Corp.
Pratt & Whitney
Premier Metal Etching Co.
Republic Gage Co.
Rimat Tool Co.
Scherr Co., Inc.
Sheffield Corp.
Simpson Electric Co.
Size Control Co.
Standard Gage
Starrett Co.
Stocker & Yale
Swedish Gage Co.
Taft-Peirce
Vinco Corp.
West & Dodge Thread
Woodworth Co.
Zeiss, Inc., Carl

GAGES, Sliding

Acme Industrial
Amer. Measuring Insts.
Brown & Sharpe
Lufkin Rule Co.
Pratt & Whitney
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Van Keuren Co.

GAGES, Snap

Acme Industrial
Allen Gauge & Tool Co.
American Measuring Insts.
Brown & Sharpe
Cadillac Gage Co.
Chicago Dial Indicator Co.
ConRay Corp.
Dearborn Gage Co.
Detroit Tap & Tool
DoAll Co.
Ercona Corp.
Federal Products Corp.
Fonda Gage Co.
Greenfield Tap & Die
Jansson Gage Co.
Jerpbak-Bayless Co.
Johnson Gage Co.
Lawrence & Hill
Merz Engineering
Metzger & Son
Morse Co., H. E.
Mueller Laboratory
Myer Corp.
Nilsson Gage Co.
Pratt & Whitney
Precision Gage & Tool
Rimat Tool Co.
Scherr Co.
Sheffield Corp.
Simpson Electric Co.
Size Control Co.
Standard Gage
Sturdy Tool & Gage
Swedish Gage Co.
Taft-Peirce
Taper Micrometer
Vinco Corp.

GAGES, Spline

Acme Industrial
American Meas. Insts.
Brown & Sharpe
Comtor Co.
Federal Products Corp.
Jerpbak-Bayless Co.
Kahn & Co.
Merz Engineering
Myer Corp.
Nilsson Gage Co.
Pratt & Whitney
Precision Gage & Tool
Rimat Tool
Sheffield Corp.
Size Control Co.
Standard Gage
Sturdy Tool & Gage
Taft-Peirce
Vinco Corp.

GAGES, Star

Federal Products Corp.
Moore Products
Nilsson Gage Co.
Pratt & Whitney
Rimat Tool
Sheffield Corp.

GAGES, Strain

Acme Industrial
American Inst. Co.
Anderson, Arthur R.
Ann Arbor Inst. Works
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bendix Pacific Div.
Bristol Co.
Computer Instrument Corp.
Control Devices Inc.
Edin Electronics
Eitzen Co.
Electronic Products Co.
Federal Products Corp.
Fielden Instrument
Gaydon Co.
GE Apparatus Sales
Giannini & Co.
Gilmore Industries
Gulton Mfg.
Hamilton Watch Co.
Hathaway Inst. Co.
Hays Corp.
Heiland Div.
Industrial Electronics
Metzger & Son
Miller Corp., Wm.
Olsen Testing Machine
Pratt & Whitney
Reed Research
Revere Corp.
Riehle Testing Mach.
Scientific Enterprises
Sheffield Corp.
Size Control Co.
Starrett Co.
Statham Labs.
Swedish Gage
Technograph Printed Elec.
Testing Machines Inc.
Thwing-Albert Inst.
Trans-Sonic, Inc.

GAGES, Stream

Bristol Co.
G.M. Mfg. Co.
Hays Corp.
Leupold & Stevens
Penn Ind. Inst. Corp.

GAGES, Surface

Acme Industrial
American Meas. Insts.
Ames Co., B. C.
Blake Co. Edward
Brown & Sharpe
Brush Electronics Co.
Comtor Co.
Dearborn Gage Co.
DoAll Co.
Edin Electronics
Federal Products Corp.
Fielden Instrument
Genales, Andrew
Industrial Electronics
Jansson Gage Co.
Lufkin Rule Co.
Micrometrical Mfg.
Millers Falls Co.
Nilsson Gage Co.
Optron Laboratory
Perkin-Elmer Corp.
Precision Scientific
Scherr Co., Inc.
Sheffield Corp.
Simpson Electric Co.
Size Control Co.
Standard Gage
Starrett Co.
Swedish Gage
Taper Micrometers
Zeiss, Inc., Carl

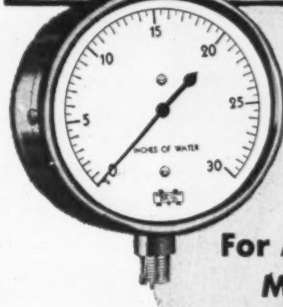
GAGES, Surface Finish Checking

Arlin Products
Blake Co., Edward
Brush Electronics Co.
Clevite-Brush
Co-design Corp.
Compar. Inst. Co.
DoAll Co.
Engis Equipment
Ercona Corp.
Fielden Instrument
GE Apparatus Sales
Industrial Electronics
Link Eng. & Mfg.
Lufkin Rule Co.
Micrometrical Mfg. Co.
Perkin-Elmer Corp.
Scherr Co., Inc.
Sheffield Corp.
Simpson Electric Co.
Size Control Co.
Stocker & Yale
Sturdy Tool & Gage
Surface Checking Gage
Swedish Gage
Williamson Dev.
Zeiss, Inc., Carl

GAGES, Taper

Acme Industrial
American Gage Co.
Brown & Sharpe
Cadillac Gage Co.

MARSHALLTOWN



DIAPHRAGM GAUGE

For Accurate Pressure Measurement in Ounces or Inches of Water

Available in standard dials (reading in inches of water) 0-15" -0-30" -0-60" -0-100" 0-160" . . . also in ounce graduated dials from 15 ounces to 5 pounds. 2½", 3½" and 4½" dial sizes mounted in black enameled steel case.

Marshalltown Figure 83 is an extremely sensitive gauge that uses a carefully seasoned bronze diaphragm to accurately measure very low pressures. It is used extensively on many types of natural gas installations for checking low pressures.

Write for details and price. LOOK TO MARSHALLTOWN FOR ONE OF THE MOST COMPLETE LINES OF INDICATING PRESSURE GAUGES MADE!

MARSHALLTOWN MANUFACTURING CO.
MARSHALLTOWN 3, IOWA

For more information circle 161 on inquiry card.

Aeromarine

LOW PRESSURE APPLICATIONS

LBS. P. .O. INCH
AEROMARINE
NEW YORK
1
2
3
5
10
8
6
5
4
3
2
1
−
+

INDUSTRIAL:

Pressure gauges:
Ranges from 0 - 10 inches of water
up to 0 - 30 P.S.I.

Vacuum gauges:
Ranges from 0 - 10 inches of water
up to Full vacuum

Differential Pressure Gauges:
Ranges: Same as Pressure gauges

Compound:
Both Pressure and Vacuum readings on dial (as illustrated).

These gauges are available with linear, expanded, or retarded dials.

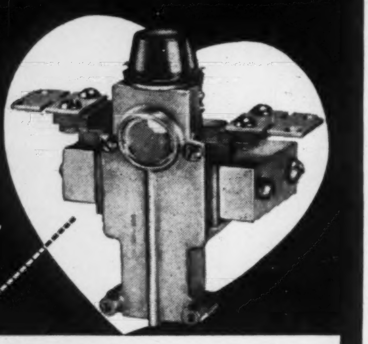
AIRCRAFT:

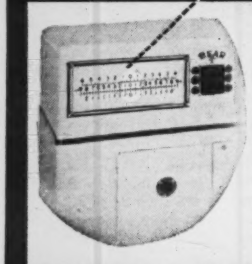
Flight instruments, both civilian and Air Force.

Aeromarine Instrument Co., Inc.
389 GERARD AVE., NEW YORK 51, N. Y.

For more information circle 162 on inquiry card.

Make a G-M PORTABLE D'ARSONVAL
GALVANOMETER
the Heart of Your Instrument

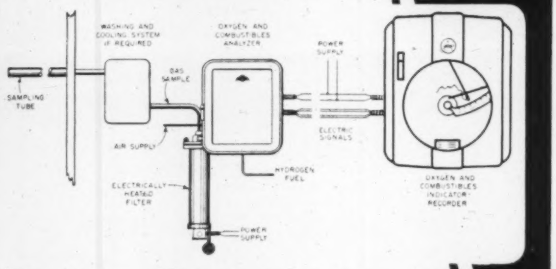




IN THE AUTOMOTIVE FIELD, the Bear Manufacturing Co. of Rock Island, Ill. uses Series 500 G-M Galvanometers in its new remote-reading Electric Wheel Alignment System (left). Whatever your own particular instrument field, you can achieve this same self-contained portability, ruggedness and high sensitivity with G-M Galvanometers. Complete catalog on request.

G-M LABORATORIES • INC.
4316 NORTH KNOX AVE., CHICAGO 41
In Canada: Cossor (Canada) Ltd., 301 Windsor St., Halifax N. S.
For more information circle 163 on inquiry card.

GAS ANALYZERS
BAILEY METERS
for Oxygen & Combustibles Content of Gases


WASHING AND COOLING SYSTEM IF REQUIRED
OXYGEN AND COMBUSTIBLES ANALYZER
POWER SUPPLY
GAS SAMPLE
SAMPLING TUBE
ELECTRIC SIGNALS
AIR SUPPLY
HYDROGEN FUEL
ELECTRICALLY HEATED FILTER
OXYGEN AND COMBUSTIBLES INDICATOR-RECORDER
POWER SUPPLY

This sampling, analyzing, recording and/or controlling system provides continuous and independent analysis of oxygen and/or combustibles. Analyzer uses hydrogen and/or air for catalytic combustion of sample. Minimum range: 0-5%; maximum range 0-25%.
Ideal combustion guide and safety device for furnaces, kilns, and heaters. Analyzes and controls output from atmosphere generators.

For detailed information request:
Product Specification E65-1 on Analyzers for Oxygen and Combustibles.
Product Specification E65-2 on Analyzers for Oxygen.
Product Specification E65-3 on Analyzers for Combustibles.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND 10, OHIO
For more information circle 164 on inquiry card.

ConRay Corp.
Dearborn Gage Co.
DoAll Co.
Elgin National Watch
Esterline Angus Co., Inc.
Federal Prod. Corp.
Fonda Gage Co.
General Electric
Greenfield Tap & Die
Industrial Electronics
Kahn & Co.
Lincoln Park Tool
Merz Engineering
Micro Master Co.
Moore Products
Myer Corp.
Nilsson Gage Co.
Poole Instruments
Precision Gage & Tool
Pratt & Whitney
Republic Gage Co.
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Standard Gage
Starrett Co.
Sturdy Tool & Gage
Swedish Gage
Taft-Peirce
Taper Micrometers
Tensitron, Inc.
Van Kruenen Co.
Vinco Corp.
Woodworth Co.

GAGES, Telescoping

Brown & Sharpe
DoAll Co.
Federal Products Corp.
Lufkin Rule Co.
Scherr Co., Inc.
Size Control Co.
Starrett Co.
Swedish Gage Co.

GAGES, Thickness

ACF Electronics Div.
Aero Electronics
American Inst. Co.
American Tradair Corp.
Ames Co., B. C.
Amthor Testing Inst. Co.
Anton Electronic Labs.
Applied Research Labs.
Arlin Products
Automatic Temp. Control
Bailey Meter Co.
Bausch & Lomb Optical Co.
Branson Instruments
Brown & Sharpe
Bush Associates
Canadian Radium
Commercial Research
Control Devices Inc.
Curtiss-Wright
Custom Scientific Insts.
Daytronic Corp.
Dearborn Gage Co.
Dice Co., J. W.
DoAll Co.
Edin Electronics
Electric Eye Equip.
Elgin National Watch
Federal Prod. Corp.
Fielden Instrument
Fonda Gage Co.
Forro Scientific
Gardner Lab.
GE Apparatus Sales
General Elec. X-Ray Corp.
Glogau & Co.
Hathaway Inst. Co.
Hays Corp.
Ill. Testing Labs.
Indus. Electronics (Mass.)
Industrial Electronics
Industrial Gauges Corp.
Industrial Nucleonics
Instrument Dev. Labs.
Instruments, Inc.
Kahn & Co.
Kocour Co.
Krouse Testing Machine
Lawrence & Hill
Lufkin Rule Co.
Magnaflux Corp.
Marshall Co.
Merz Engineering
Metzger & Son
Millers Falls Co.
Moore Products
Myer Corp.
Nife Inc.
Nilsson Gage Co.
North American Philips
Nuclear Research
Ohmart Corp.
Photocon Research
Poole Instruments
Pratt & Whitney
Precision Gage & Tool
Precision Scientific Co.
Precision Therm & Inst.
Radioactive Products
R-C Scientific
Robertshaw-Fulton Co.
Rockwell Eng'ng.
Saart, Kraemer & Hanscom
Scherr Co., Inc.
Scott Testers
Sheffield Corp.
Size Control Co.
Speidel & Co.
Sperry Products, Inc.
Standard Elec.
Standard Gage
Starrett Co.
Sturdy Tool & Gage
Swedish Gage
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Ti-Pi Co.
Tracerlab Inc.
United Engineers
Van Keuren Co.
Waltham Dial Gage
Westinghouse Elec.
Westinghouse X-Ray Co.
Woodworth Co.

GAGES, Thickness, Magnetic

Aero Electronics
American Inst. Co.
Branson Instruments
Bristol Co.
Cleveland Inst.
Commercial Research
Daytronic Corp.
Electric Eye Equip.
Federal Products Corp.
Gardner Lab.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
Industial Electronics
Krouse Testing Machine
Magnaflux Corp.
Metron Instrument
Pratt & Whitney
Schaevitz Engg.
Sheffield Corp.
Sunshine Scientific

GAGES, Thickness, Ultrasonic

Branson Instruments, Inc.
Bristol Co.
Dice Co., J. W.
DoAll Co.
Gulton Mfg. Co.
Instruments, Inc.
Kahn & Co.
Magnaflux Corp.
Photocon Research
Pratt & Whitney
Sheffield Corp.
Sunshine Scientific
Vibro-Ceramics

GAGES, Thread

Acme Industrial
Brown & Sharpe
Bryant Chucking Grinder
DoAll Co.
Engis Equipment
Federal Products Corp.
Fonda Gage
Greenfield Tap & Die
Jerpbak-Bayless Co.
Johnson Gage Co.
Kahn & Co.
Lufkin Rule Co.
Morse Co., H. E.
Myer Corp.
Pratt & Whitney
Republic Gage Co.
Rimat Tool Co.
Scherr Co., Inc.
Sheffield Corp.
Simpson Electric
Size Control Co.
Standard Gage
Starrett Co., L. S.
Stocker & Yale
Sturdy Tool & Gage
Swedish Gage Co.
Taft-Peirce

GAGES, Tide

American Instrument Co.
Bristol Co.
Uehling Inst. Co.

GAGES, Torque

Aero Electronics
Airdraulics Engineerings
Automatic Temp. Control
Baldwin-Lima-Hamilton
Chatillon & Sons
Donner Scientific
Federal Products Corp.
Fielden Instrument
General Elec. Co.
Gilmore Industries
Hagan Corp.
Hathaway Inst. Co.
Herman, Victor George
International Dev. Co.
Jo-Line Tools
Metron Instrument
Pelouze Mfg. Co.
Revco, Inc.
Riehle Div.
Ruge-deForest, Inc.
Schaevitz Engg.
Statham Labs.
Sturdy Tool & Gage
Sturtevant Co.
Taylor Inst. Cos.
Toledo Scale Co.
U. S. Gauge Co.
Waters Mfg.

GAGES, Vacuum (See Gages, Pressure)

GAGES, Venturi (See Flowmeters, Venturi)

GAGES, Vibration

ACF Electronics Div.
Advanced Electronics Inc.
Atlantic Research
Beta Corp.
Chesapeake Inst.
Consolidated Engg. Corp.
Control Devices Inc.
Daytronic Corp.
Electro Products Labs.
Endevco Corp.
Erwood, Inc.
Fielden Instrument
G E Apparatus Sales
GE Instrument Dept.
Gulton Mfg. Co.
Industrial Electronics
Kybernetes Corp.
Lab-Tronics
Panoramic Radio Products
Scott, Inc., H. H.
Sheffield Corp.
Statham Labs.
Vibra Shock Corp.
Walkirt Co.
Wiancko Engineering

GAGES, Water Level (See GAGES, Liquid Level)

GAGES, Wind

Aero Electronics
American Inst. Co.
Bacharach Ind. Inst.
Baldwin-Lima-Hamilton
Boston Auto Gage Co.
Dwyer Mfg. Co.
Electric Speed Ind.
Friez Inst. Div.
G. M. Mfg. Co.
Green, Henry J.
Gurley, W. & L. E.
Hastings Inst. Co.
Illinois Testing Labs.
Instruments Corp.
Kenyon Inst. Co.
Leupold & Stevens
Rieker Inst. Co.
Stewart, M. C.
Taylor Inst. Cos.
Thomas Co., Arthur H.
Victory Engg.
Wiancko Eng'ng.

GAGES, Wire Measuring

Amer. Measuring Insts.
Ames Co., B. C.
Brown & Sharpe
Elgin National Watch
Ercona Corp.
Federal Prod. Corp.
Foxboro Co.
General Elec. Co.
Greenfield Tap & Die
Hathaway Inst. Co.
Industrial Gauges Corp.
Merz Engineering
Moore Products
Nilsson Gage Co.
Pratt & Whitney
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Standard Elec.
Starrett Co.
Stocker & Yale
Swedish Gage Co.

GAGING FIXTURES

Acme Industrial
Amer. Measuring Insts.
Allen Gauge & Tool Co.
Brown & Sharpe
ConRay Corp.
Daco Machine & Tool
Dearborn Gauge Co.
DoAll Co.
Eitzen Co.
Electric Eye Equip.
Elgin National Watch
Federal Products Corp.
Fonda Gage Co.
Jansson Gage
Kahn & Co.
Lawrence & Hill
Link Engineering
Merz Engineering
Morse Co., H. E.
Myer Corp.
Precision Gage & Tool
Ryan Tool and Engg.
Saart, Kraemer & Hanscom
Sheffield Corp.
Size Control Co.
Stocker & Yale
Sturdy Tool & Gage
Swedish Gage
Taft-Peirce
Waltham Dial Gage
Wilmotte, Inc.
Woodworth Co.

GALVANOMETERS, A-c

Assembly Products
Associated Research
James G. Biddle Co.
Bristol Co.
Brush Electronics
Cambridge Inst. Co.
Central Scientific Co.
Century Geophysical
Columbus Products Corp.
Consolidated Engg.
Dale Instruments
Edin Co., Inc.
Electro-Mechanical Res.
General Elec. Co.
General Radio Co.
Gilman Scientific
Greibach Instrument
Hamilton Watch Co.
Hathaway Inst. Co.
Heiland Div.
Hickok Elec. Inst.
Leeds & Northrup Co.
Miller Corp.
Metron Instrument
Pfaltz & Bauer, Inc.
Rawson Electrical Inst.
RCA Div.
Roller-Smith Co.
Rubicon Co.
Sanborn Company
Sensitive Research Inst.
Shallcross Mfg. Co.
Simpson Electric Co.
Techical Inst. Inc.
United Optical Mfg.
Welch Mfg. Co.
W. M. Welch Scientific Co.
Weston Elec. Inst.

GALVANOMETERS, Astatic
Bristol Co.
Cambridge Inst. Co.
Central Scientific Co.
Chicago Apparatus Co.
Dale Instruments
Geotechnical Corp.
Hamilton Watch Co.
Hathaway Inst. Co.
Leeds & Northrup Co.
Phaostron Co.
Rawson Electrical Inst.
Ruska Instrument
Sensitive Research Inst.
Welch Scientific
Westinghouse Elec.

GALVANOMETERS, D-c
Assembly Products
Associated Research
Biddle Co., James G.
Borden Engineering
Brush Electronics
Cambridge Inst. Co.
Central Scientific Co.
Century Geophysical
Clevite-Brush
Coleman Inst. & Mfg.
Columbus Products Corp.
Consolidated Engg.
Dale Instruments
DeJur-Amsco
Doelcam Div.
Edin Co., Inc.
Edison Inc., T. A.
Electric Des. & Eng.
Electro-Mechanical Res.
Electronic Development
Engelhard, Charles
Federal Telephone
GE Instrument Dept.
Geotechnical Corp.
Gilman Scientific
G-M Labs.
Greibach Instruments
Hamilton Watch Co.
Hathaway Inst. Co.
Heiland Div.
Hickok Elec. Inst.
Hormell Instrument Co.
Industrial Control
Jarrell-Ash Co.
J-B-T Instrument Co.
Leeds & Northrup Co.
Marion Electric Inst.
Meters, Inc.
Metron Instrument
Mil Instrument Corp.
Miller Instruments
Minneapolis-Honeywell
Phoenix Precision Inst.
Phototron Inst. Corp.
Physics Research Labs.
Rawson Electrical Inst.
RCA Div.
Roller-Smith Co.
Rubicon Co.
Sanborn Co.
Scientific Specialties
Sensitive Research Inst.
Shallcross Mfg. Co.
Simpson Elec. Co.
Southwestern Ind. Elec.
Technical Inst. Inc.
Technology Inst. Corp.
Thwing-Albert Inst.
Triplett Elec. Inst.
United Optical Mfg.
W. M. Welch Scientific Co.
West Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

GALVANOMETERS, Magnetostriction
Edin Co., Inc.
Hamilton Watch Co.
Magnetic Ind.

GALVANOMETERS, Piezoelectric
Gulton Mfg. Co.
Wright Eng'ng Co.

GALVANOMETERS, Reflecting
Associated Research
Berndt-Bach Inc.
Brush Electronics
Cambridge Inst. Co.
Century Geophysical
Coleman Instrument
Consolidated Engg.
Epic, Inc.
Ercona Corp.
Federal Telephone
GE Apparatus Sales
Geotechnical Corp.
Gilman Scientific Instr.
G-M Laboratories
Hamilton Watch Co.
Hathaway Inst. Co.
Heiland Div.
Hormell Instrument Co.
Jarrell-Ash Co.
Leeds & Northrup
Magnetic Ind.
Midwestern Instrument
Pfaltz & Bauer
Phoenix Precision Inst.
Physics Research Labs.
Rawson Electrical Inst.
Rubicon Co.
Sanborn Co.
Southwestern Ind. Elec.
Sprengnether Inst. Co.
Technical Inst. Inc.
Thwing-Albert Inst. Co.
United Optical Mfg.
W. M. Welch Scientific Co.

GALVANOMETERS, Vacuum-tube
Associated Research
Beckman Insts.
Bristol Co.
Doelcam Div.
Electronic Dev. Lab.
Electro Products Lab.
Engineering Labs., Inc.
General Radio
Hamilton Watch Co.
Harvey Radio Labs.
Hathaway Instrument Co.
Heiland Div.
Industrial Test Equip.
International Std. Trading
MacDonald Co., W. S.
Measurements Corp.
Millivac Instruments
RCA Div.
Rockwell Engr.
Sanborn Co.
Shallcross Mfg. Co.
Varo Mfg. Co.
Weston Elec. Inst.

GALVANOMETERS, Vibration
Century Geophysical
Consolidated Engg.
Epic, Inc.
Gilman Scientific Inst.
Hamilton Watch Co.
Hathaway Inst. Co.
Heiland Div.
Leeds & Northrup
Miller Corp.

GALVANOSCOPES
Central Scientific Co.
Jarrell-Ash Co.
Stoelting Co., C. H.
W. M. Welch Scientific Co.

GAS ANALYZERS, Air
Allied Eng'ng Div.
Atmosphere Control
Burrell Corp.
Cambridge Inst. Co.
Central Scientific Co.
Consolidated Engg. Corp.
Cook Electric
Davis Emergency Equip.
Engelhard, Chas.
Ficklen, Joseph
Fish-Schurman Co.
Fisher Scientific Co.
Friez Div.
GE Apparatus Sales
Gow-Mac Inst.
Greiner Glassblowing Lab.
Hays Corp.
Hebler Co.
Johnson-Williams, Ltd.
Jordan Electronic Mfg.
Liston-Becker Inst. Co.
Mercoid Corp.
Mine Safety Appliances
Perkin-Elmer Corp.
Permutit Co.
Process & Instruments
Refinery Supply Co.
Sargent & Co., E. H.
Scientific Glass App.
Staplex Co.
Thermco Labs.
Victory Engr. Co.
Weston Elec. Inst.
Wilson Products, Inc.

GAS ANALYZERS, Ammonia
Applied Physics Corp.
Baird Associates
Burrell Corp.
Consolidated Engg. Co.
Davis Instruments
Engelhard, Chas.
General Elec. Co.
Gow-Mac Instrument
Hallikainen Instruments
Hays Corp.
Hebler Co.
Johnson-Williams, Ltd.
Kaye Development
Liston-Becker Inst. Co.
Mercoid Corp.
Mine Safety Appliances
Mira Scientific Inst.
Perkin-Elmer Corp.
Permutit Co.
Process & Instruments
Sargent & Co, E. H.
Thermco Labs.
Victory Engr. Co.
Weston Elec. Inst.

GAS ANALYZERS, Carbon Dioxide
Ace Glass, Inc.
Allied Eng'ng Div.
Applied Physics Corp.
Atmosphere Control
Bacharach Industrial Inst.
Baird Associates
Burrell Corp.
Cambridge Inst. Co.
Central Scientific Co.
City Service Oil Co.
Cleveland Fuel Equip.
Davis Instruments
Dwyer Mfg. Co.
Ellison Draft Gage Co.
Engelhard, Chas.
Fish-Schurman Co.
Fisher Scientific
Foxboro Co.
Friez Instrument
General Elec. Co.
Gordon Co., Claud S.
Gow-Mac Instrument
Greiner Glassblowing Lab.
Hallikainen Instruments
Hays Corp.
Hebler Co.
Instrument Engr. Serv.
Kaye Development
Laboratory Equip. Co.
Lapine & Co.
Leeds & Northrup Co.
Liston-Becker Inst. Co.
Liston-Folb
Machlett & Son
Mine Safety Appliances
Mira Scientific Inst.
Perkin Elmer Corp.
Permutit Co.
Phipps & Bird
Podbielniak, Inc.
Potter Co.
Precision Therm.
Preferred Utilities Mfg.
Process & Instruments
Refinery Supply Co.
Republic Flow Meters
Sargent & Co.
Schauer Mfg. Co.
Scientific Glass App.
Scientific Inst. Co.
Standard Instrument
Testing Machines, Inc.
Thermco Labs.
Uehling Instrument Co.
Victory Engr. Co.
Viking Instruments
Williams Apparatus Co.

GAS ANALYZERS, Carbon Monoxide
Allied Eng'ng Div.
Applied Physics Corp.
Atmosphere Control
Bacharach Industrial Inst.
Bailey Meter Co.
Baird Associates
Bristol Engg. Corp.
Burrell Corp.
Cambridge Inst. Co.
Central Scientific
Chicago Apparatus Co.
City Service Oil Co.
Davis Emergency Equip.
Eclipse Aviation
Electric Heat Control
Ellison Draft Gage
Engelhard, Chas.
Fish-Schurman Co.
Fisher Scientific
General Elec. Co.
Greiner Glassblowing Lab.
Hallikainen Instruments
Hays Corp.
Hebler Co.
Kaye Development
Laboratory Equip. Co.
Leeds & Northrup Co.
Liston-Becker Inst. Co.
Liston-Folb
Machlett & Son
Mine Safety Appliances
Perkin-Elmer Corp.
Podbielniak, Inc.
Sargent & Co., E. H.
Scientific Glass App.
Scientific Inst. Co.
Sorvall Inc., Ivan
Taller & Cooper
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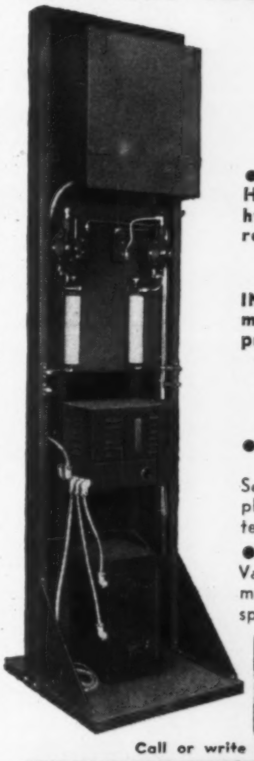
—for plant streams and laboratory



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Podbielniak, Inc.
Precision Scientific
Victory Engr. Co.
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Fisher Scientific
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Mira Scientific Inst.
North American Philips
Perkin-Elmer Corp.
Podbielniak, Inc.
Precision Scientific
Taller & Cooper
Thermco Labs.
Victory Eng. Co.

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Consolidated Engg. Co.
Davis Instruments
Electrical Dev.
Engelhard, Chas.
Fisher Scientific
General Elec. Co.
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Kaye Development
Leeds & Northrup
Mine Safety Appliances
Mira Scientific Inst.
Permutit Co.
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Atmosphere Control
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Cambridge Inst. Co.
Connelly Co.
Consolidated Engg.
Davis Instruments
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Engelhard, Chas.
Fisher Scientific
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Industrial Inst. Inc.
Kaye Development
Liston Becker Inst.
Mine Safety Appliance
Mira Scientific Inst.
Perkin-Elmer Corp.
Permutit Co.
Rubicon Co.
Sargent & Co.
Scientific Glass Apparatus
Taller & Cooper Inc.
Victory Engr. Co.
Viking Instruments

GAS ANALYZERS, Nitric Oxide
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Atmosphere Control
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Beckman Instruments
Cambridge Inst. Co.
Consolidated Engg.
Davis Instruments
Engelhard, Chas.
Fisher Scientific
General Electric Co.
Hays Corp.
Kaye Development
Liston-Becker Co.
Liston-Folb
Mine Safety Appliances
Mira Scientific Inst.
Perkin-Elmer Corp.
Rubicon Co.
Sargent & Co.
Victory Engr. Co.

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Bacharach Ind. Inst.
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Burrell Corp.
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Chicago Apparatus Co.
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Fish-Schurman Co.
Fisher Scientific Co.
Greiner Glassblowing Lab.
Hays Corp.
Howe & French, Inc.
Laboratory Equip. Corp.
Lapine & Co.
Machlett & Son
Podbielniak, Inc.
Precision Therm.
Sargent & Co.
Scientific Glass App.
Specialty Glass Co.
Thomas Co., Arthur H.

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Atmosphere Control
Bacharach Industrial Inst.
Bailey Meter Co.
Beckman Instruments
Burrell Corp.
Cambridge Inst. Co.
Chicago Apparatus Co.
Consolidated Engg. Corp.
Davis Instruments
Dorber Co.
Eclipse Aviation
Ellison Draft Gage
Engelhard, Charles
Foxboro Co.
Gow-Mac Instr.
Greiner Glassblowing Lab.
Hays Corp.
Hebler Co.
Instrument Engr. Serv.
Jordan Electronic Mfg.
Laboratory Equip. Corp.
Leeds & Northrup
Mine Safety Appliances
Mira Scientific Inst.
Phipps & Bird
Podbielniak, Inc.
Precision Scientific
Process & Instruments
Sargent & Co.
Scientific Glass App.
Superior Meter Co.
Thermco Labs.
Victory Engr. Co.
Weston Elec. Inst.

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Beckman, Inc., Arnold O.
Beckman Inst.
Bellco Glass, Inc.
Boekel & Co.
Burrell Corp.
Cambridge Inst. Co.
Central Scientific Co.
Clarostat Mfg. Co., Inc.
Davis Instruments
Defender Inst. & Res.
Ellison Draft Gage
Engelhard, Inc., Charles
Fisher Scientific
Gow-Mac Instrument
Greiner Glassblowing Lab.
Hays Corp.
Hebler Co.
Instrument Engr. Serv.
Jordan Electronic Mfg.
Laboratory Equip. Co.
Leeds & Northrup
Mine Safety App. Co.
Mira Scientific Inst.
Podbielniak, Inc.
Precision Scientific
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Sargent & Co.
Scientific Glass App.
Tagliabue Div.
Technical Equipment
Thermco Labs.
Victory Engr. Co.
Weston Elec. Inst.

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Fish-Schurman Co.
Foxboro Co.
Gow-Mac Instr.
Greiner Glassblowing Lab.
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Precision Scientific
Sargent & Co.
Scientific Glass App.
Skaneateles Mfg. Co.
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Thermco Labs.
Uehling Instrument Co.
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Republic Flow Meters
Shallcross Controls
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Fischer & Porter
Fisher Res. Lab.
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Gilmore, E. R.
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Continental Electric
DuMont Labs., Inc., A. B.
Eclipse-Pioneer
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Electrons, Inc.
Gaertner Scientific
General Electric
General Physical Lab.
Jarrell-Ash Co.
Morgan Instrument
Radiation Counter Labs.
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Skaneateles Mfg.
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Jarrell-Ash Co.
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C.G.S. Labs.
Electronic Products Co.
Gaertner Scientific
General Physical Lab.
Hanovia Chem. Lab.
Jarrell-Ash Co.
Radiation Counter Labs.
Skaneateles Mfg. Co.
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Sylvania Elec. Prod.
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Uniform Tubes
Vacuum Tube Prods.

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Amperex Electronic Corp.
Aristo Grid Lamp Products,
Bausch & Lomb
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C.G.S. Labs.
Continental Electric Co.
Cooper-Hewitt Elec.
Edmund Scientific
Electronic Products
Fish-Schurman Co.
Fredericks, George
Gaertner Scientific
Gates & Co., George W.
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General Physical Lab.
Greiner Glassblowing Lab.
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Menlo Research Lab.
Mico Instrument
Pfaltz & Bauer

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Radiation Counter Labs.
Raytheon Mfg.
Skaneateles Mfg. Co.
Tube Department, GE
Universal X-Ray Prods.
Vacuum Tube Prods.

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Aristo Grid Lamp Products,
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C.G.S. Labs.
Continental Electric
Eclipse-Pioneer
Edmund Scientific
Electronic Products
Fredericks, George
Gaertner Scientific
Gen. Elec. Co.
General Physical Lab.
Greiner Glassblowing Lab.
Jarrell-Ash Co.
Machlett & Son
Morgan Instrument
Radiation Counter Labs.
Skaneateles Mfg. Co.
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Gaertner Scientific Corp.
Gates & Co., George W.
Gen. Elec. Co.
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Leitz, Inc.
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GAUGES, (See Gages)

GAUSSMETERS

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Donner Scientific
D & R Limited
Eastern Air Devices
Eclipse Pioneer
Eicor, Inc.
Electric Indicator
Electro Eng. Prod.
Electro Mechano
Electronic Instrument
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Geophysical Instrument
Georator Corp.
Hewlett-Packard
Holtzer-Cabot
Industronics
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Instrument Motors Co.
Kearfott Co.
Kollsman Instrument
Krohn-Hite Inst.
Lear Inc.
Magnetic Instrument
Marble-Card Electric
Marconi Instruments
Newage International
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Sangamo Generators
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General Electric
Howard Industries
International Telemeter
Kay Electric Co.
Krohn-Hite Inst.
Lavoie Laboratories
Magnetic Instrument
Marconi Inst., Ltd.
Nalley, Leonard L.
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Rutherford Electronics
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Magnetic Instrument
Marble-Card Electric
Newage International
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Servo Tek Products
Small Motors
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Berkshire Laboratories
Beva Laboratory
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Canoga Corp.
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Krohn-Hite Inst.
Lavoie Labs.
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Measurements Corp.
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Minnesota Electronics
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New Jersey Elec.
Nuclear Chicago
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Potter Instruments
Precise Development
Radiation Counter Labs
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Rutherford Electronics
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Spencer-Kennedy
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Telechrome, Inc.
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D & R Limited
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Electro Engg. Products
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Electronic Measurements
Espey Mfg.
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Harvey Radio Labs.
Hewlett-Packard
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Jackson Co., Byron
Jackson Elec. Inst.
Kahn & Co.
Kay Electric
Kearfott (Western)
Kellogg Switchboard
Lavoie Laboratories
Lear, Inc.
Linear Equip. Labs.
Magnetic Instrument
Marconi Instruments
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Millen Mfg. Co.
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National Co.
New London Instr. Co.
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Polytechnic Res. & Dev.
Precise Development
Precision Apparatus Co.
Premier Research
Radio City Products Co.
RCA Tube
Rollin Co.
Servo Corp. of America
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Sierra Electronic Corp.
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Southwestern Ind. Elec.
Sperry Gyroscope Co.
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Trad Television
Triplett Electrical Inst.
United Electronics
United Optical Mfg.
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DeMornay-Bonardi, Inc.
Devtronics, Inc.
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Empire Devices, Inc.
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Feiler Engineering
General Electronic
General Radio Co.
Hewlett-Packard
Hickok Elec. Instr. Co.
Hycon Mfg. Co.
Instrument Dev. Labs.
Kay Electric Co.
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Krohn-Hite Inst. Co.
Lavoie Laboratories
Linear Equipment Labs.
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Marconi Insts., Ltd.
Measurements Corp.
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Shasta Div.
Spencer-Kennedy
Tektronix Inc.
Teletronics Lab.
Thordarson-Meissner
Triumph Mfg.
Walkirt Co.
Wollensak Optical Co.

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Authorized Mfgs. Serv.
Avion Div.
Brush Electronics Co.
Clough-Brengle
Electronic Instrument
El-Tronics, Inc.
Farnsworth Electronic
F.R. Machine Works
General Electronic
Hewlett-Packard
Hickok Elec. Inst. Co.
Kay Electric
Kearfott (Western)
Krohn-Hite Inst., Co.
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Marconi Insts., Ltd.
Pacific Transducer Corp.
Panoramic Radio Products
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Radio City Products
Servo Corp. of America
Southwestern Indus. Elect.
Simpson Electric Co.
Supreme, Inc.
Sylvania Elec. Prod.
Telonic Industries
Thordarson-Meissner
Triplett Elec. Inst.

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ACF Electronics Div.
Avion Div.
Boonton Radio Corp.
Browning Laboratories
Canoga Corp.
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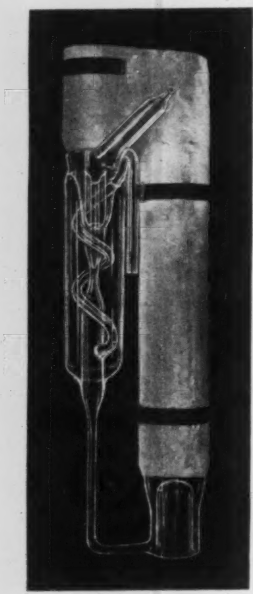

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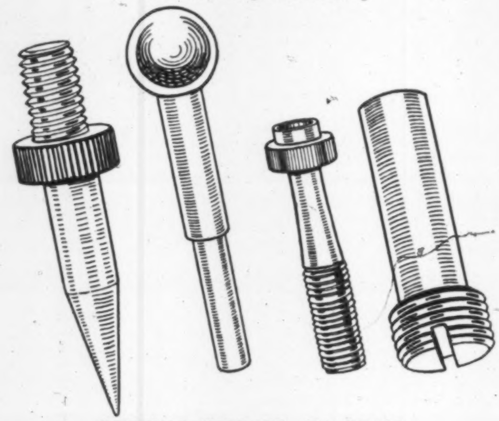

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Corning Glass Works
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GOVERNORS, Pressure (See Regulators, Automatic, Air)

GOVERNORS, Pump (See Regulators, Automatic, Air)

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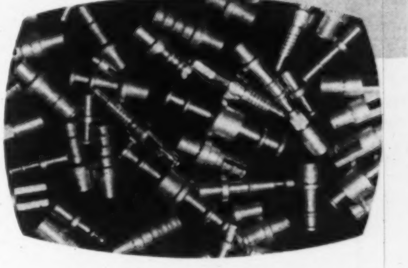

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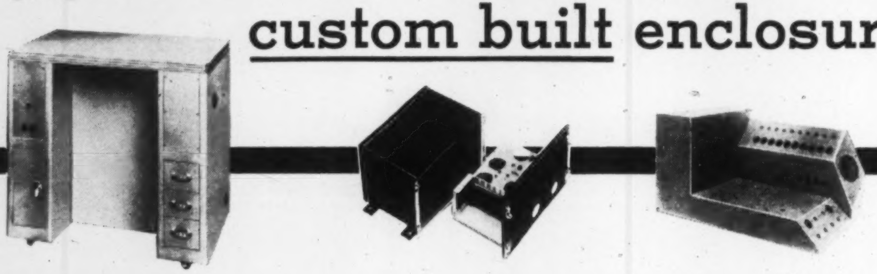

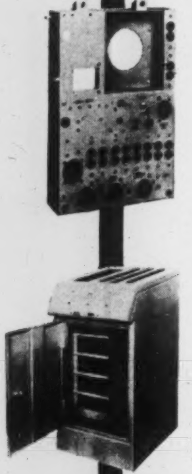

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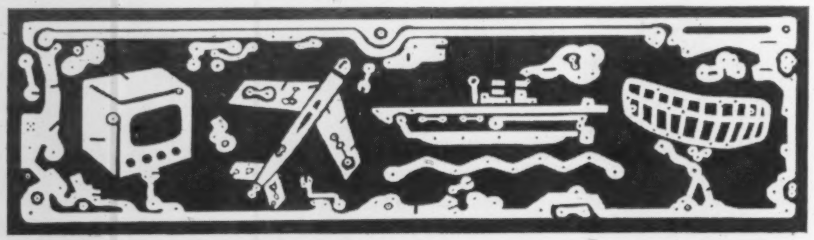

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Builders-Providence
ConRay Corp.
Falstrom Co.
G E Instrument Dept.
General Tire
I-L-S Instrument
Kahn & Co.
Kirk & Blum Mfg.
Lewyt Metal Prods.
Moran Furnace
Olympic Metal Prod.

HUMIDISTATS

Barber-Colman
Bendix Aviation Corp.
Friez Instruments Div.
Johnson Service Co.
Kahn & Co.
Minneapolis-Honeywell
Powers Regulator Co.
Physical Research
Soreng Products
Taylor Instrument Cos.

HUMIDITY INSTRUMENTS, Aspiration (See Psychrometers, Aspiration)

HUMIDITY INSTRUMENTS, Conductivimetric

Bristol Co.
Electric Hotpack Co.
Foxboro Co.
Friez Instr. Div.
General Mills Inc.
Gow-Mac Instr.
Industrial Instr. Inc.
Leeds & Northrup Co.
Marconi Instruments
Physical Research Labs.
Serdex, Inc.
Testing Machines, Inc.

HUMIDITY INSTRUMENTS, Hygrometric (See Hydrometers)

HUMIDITY INSTRUMENTS, Hygroscopic

American Inst. Co.
Anders Lykens Corp.
Barber Colman
Bendix Aviation Corp.
Bristol Co.
Cambridge Instrument Co.
Fielden Instrument
Foxboro Co.
Friez Instruments Div.
G. M. Mfg. Co.
Gotham Inst. Div.
Hallikainen Instruments
Johnson Service Co.
Kahl Scientific Inst.
Minneapolis-Honeywell
Moeller Inst. Co.
Powers Regulator
Serdex, Inc.
Taylor Inst. Cos.
Testing Machines, Inc.
Victory Engg.

HUMIDITY INSTRUMENTS, Sling Psychrometric (See Psychrometers, Sling)

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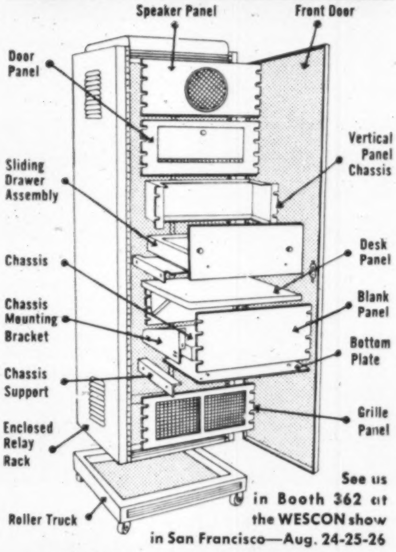

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PRECISION-BUILT METAL HOUSINGS
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HUMIDITY, Relative, Indicating Recorders
Alden Products
Anders Lykens Corp.
American Inst. Co.
Automatic Temp. Control
Axion Div.
Barber-Colman Co.
Bendix Aviation Corp.
Bill Jack Scientific
Bristol Co.
Cambridge Inst. Co.
Fielden Instrument
Fischer & Porter
Food Technology, Inc.
Foxboro Co.
Friez Instruments Div.
Gotham Instrument Div.
Gow-Mac Instr.
Green, Henry J.
Johnson Service
Kahl Scientific Inst.
Leeds & Northrup
Lennard & Co.
Mason-Neilan Reg. Co.
Mine Safety Appliances
Minneapolis-Honeywell
Moeller Inst. Co.
Partlow Corp.
Physical Research Labs.
Powers Regulator
Scientific Inst. Co.
Serdex, Inc.
Taylor Inst. Cos.
Testing Machines, Inc.
Weksler Thermometer
Weston Elec. Inst.

HYDROGEN-ION DETERMINATION INSTRUMENTS
Aloe Co., A. S.
Aanlytical Measurements
Bailey Meter Co.
Beckman Instruments
Bristol Co.
Cambridge Inst. Co.
Central Scientific Co.
Coleman Instruments
Connelly, Inc.
Fisher Scientific Co.
Foxboro Co.
Gamma Inst. Co.
General Elec. Co.
Gray Instrument
Hallikainen Instruments
Hastings Inst. Co.
Hellige, Inc.
Hickok Elec. Inst.
Kacour Co.
LaMotte Chemical Prod.
Leeds & Northrup Co.
Leitz, Inc.
Macbeth Corp.
Machlett & Son
Marconi Instruments
Minneapolis-Honeywell
Pfaltz & Bauer, Inc.
Photovolt Corp.
Precision Scientific
Rascher & Betzold
Rawson Elec. Inst. Co.
Rubicon Co.
Sargent & Co.
Taylor & Co., W. A.
Technical Products
Testing Machines, Inc.
Thomas Co., Arthur H.
Thwing-Albert Inst. Co.
Wallace & Tiernan
Welch Scientific
Weston Elec. Inst.
Wilkens-Anderson Co.
Wilson Co.

HYDROGENATION APPARATUS
American Inst. Co.
Autoclave Engineers
Beckman Instr.
Central Scientific Co.
Distillation Products, Inc.
Machlett & Son
Parr Instrument Co.
Podbielniak, Inc.
Precision Scientific
Pressure Products Industries

HYDROMETERS, Indicating
Ace Glass Inc.
Accuracy Scientific Inst
Bailey Meter Co.
Bendix Aviation Corp.
Brooklyn Thermometer
Fisher Scientific Co.
Fleischhauer & Son
Freas Glass Works
General Scientific Equip.
G. M. Mfg. Co., Inc.
Gotham Inst. Co.
Griebel Co.
H-B Inst. Co.
Hiergesell & Sons
Hill & Co., E. V.
Huddlesten, J. S. F.
Kahl Scientific Inst.
Kessler Co., Walter H.
Kimble Glass
Martin & Co.
Mason-Neilan Regulator
Moeller Instrument Co.
Nurnberg Therm. Co.
Owens Illinois Glass Co.
Phila. Thermometer Co.
Precision Thermometer
Rascher & Betzold
Refinery Supply
Reliable Instruments
Ruehfel Co.
Scientific Glass Apparatus
Scientific Inst. Co.
Taylor Inst. Cos.
Testing Machines, Inc.
Testrite Instrument Co.
Thermometer Corp.
Trerice Co.
Wagner & Son, Carl H.
Weksler Thermometer
Weston Elec. Inst.

HYDROMETERS, Mud
Braun Corp.
Freas Glass Works
Griebel Co.
H-B Instrument
Hiergesell & Sons
Kessler Co., Walter H.
Moeller Inst. Co.
Reliable Instrument
Testing Machines, Inc.
Wagner & Son

HYDROMETERS, Recording
Central Scientific
Foxboro Co.
Freas Glass Works
G. M. Mfg. Co.
Griebel Co.
Hallikainen Instrument
Hiegersell & Sons
Kessler Co., Walter H.
Leeds & Northrup
Mason-Neilan Regulator
Norcross Corp.
Precision Thermometer
Rascher & Betzold
Ruehfel Co.
Scientific Inst. Co.
Testrite Instrument Co.
Weksler Thermometer

HYDROMETERS, Thermo (See Hydrometers, Indicating)

HYGROMETERS, Controlling
American Inst. Co.
Bendix Aviation Corp.
Bristol Co.
Daystrom Inst.
Ess Instrument
Foxboro Co.
G. M. Mfg. Co.
Gordon Co., Claud S.
Gotham Inst. Div.
Green, Henry J.
Minneapolis-Honeywell
Moeller Inst. Co.
Physical Research Labs.
Powers Regulator
Scientific Inst. Co.
Serdex, Inc.
Taylor Inst. Co.
Testing Machines, Inc.
Trerice Co., H. O.
Weksler Thermometer
Weston Elec. Inst.

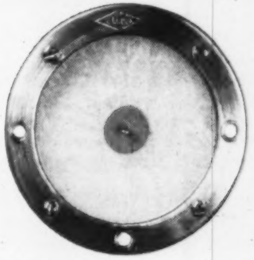
HYGROMETERS (Hair, etc.) Indicating
American Inst. Co.
Barber-Colman
Bendix Aviation Corp.
Bristol Co.
Cambridge Inst. Co.
Central Scientific Co.
Draper Mfg. Co.
Driaire, Inc.
Ever Ready Thermometer
Foxboro Co.
Friez Instruments Div.
General Mills Inc.
Glogau & Co.
G. M. Mfg. Co., Inc.
Green, Henry J.
Griebel Co.
H-B Inst. Co.
Hiergesell & Sons
Huddleston, J. S. F.
Illinois Testing Labs.
Instruments Corp.
Johnson Service Co.
Kahl Scientific Inst.
Kahn & Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Minneapolis-Honeywell
Moeller Instrument Co.
Palmer Thermometer
Phila. Thermometer Co.
Physical Research Labs.
Precision Thermometer
Riecker Inst. Co.
Sargent & Co., E. H.
Scientific Inst. Co.
Serdex, Inc.
Standard Thermometer
Taylor Inst. Cos.
Testing Machines, Inc.
Trerice Co.
Wagner & Son
Wallace & Tiernan
Weksler Thermometer
Weston Elec. & Inst.

HYGROMETERS, Recording
American Inst. Co.
Bendix Aviation Corp.
Bristol Co.
Cambridge Inst. Co.
Foxboro Co.
Friez Instrument Div.
General Elec. Co.
Gotham Instrument
Green, Henry J.
Instruments Corp.
Leeds & Northrup Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Minneapolis-Honeywell
Moeller Instrument Co.
Palmer Thermometer
Physical Research Labs.
Powers Regulator
Scientific Inst. Co.
Seedburo Equip. Co.
Serdex Inc.
Taylor Inst. Cos.
Testing Machines, Inc.

HUMIDITY!!

THE SERDEX

Animal Membrane Sensitive Diaphragm

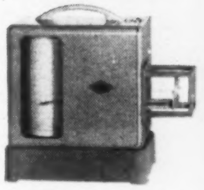


Patent Nos.
United States
2466658
Canada
457125

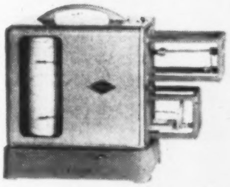
Patent Nos.
Great Britain
625443
India
35802

Heart of Serdex Hygrometric Instruments that over the years have demonstrated their ability to accurately indicate and/or record Relative Humidity over the full range of the scale, with minimum lag.

LABORATORY STANDARD
INDICATING HYGROMETER
Type HGS. HY. 1



MYCROHYGROGRAPH
Type HGS. MHY. 1



HYGROTHERMOGRAPH
Type HGS. HYT. 1

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Serdex instruments are unqualifiedly guaranteed as to accuracy for one year.

We are proud of our ability to give this guarantee—it has accompanied every instrument bearing our name and is unmatched in this field of instrumentation.

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SERDEX

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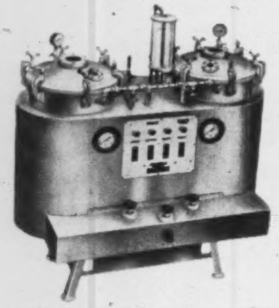
SAVE TIME and MONEY
by using Red Point
DUAL IMPREGNATORS



Two types available:
1. Electrically heated (shown at left)
2. Cold operated unit (not illustrated)

With the compact dual or two-tank impregnator, you get these advantages:

1. Deep complete impregnation under high vacuum with either cold or heated (melted) impregnants.
2. Faster production. Preheating, and moisture and air removal, is accomplished simultaneously in one tank while impregnant is in other tank. No chance for supplementary moisture to collect.
3. Longer storage of impregnants as these are always under vacuum.
4. Foaming of impregnant is eliminated and excellent drainage obtained.
5. Potting or encapsulation accomplished by adapters.
6. Every safeguard provided for protection of delicate electronic components.
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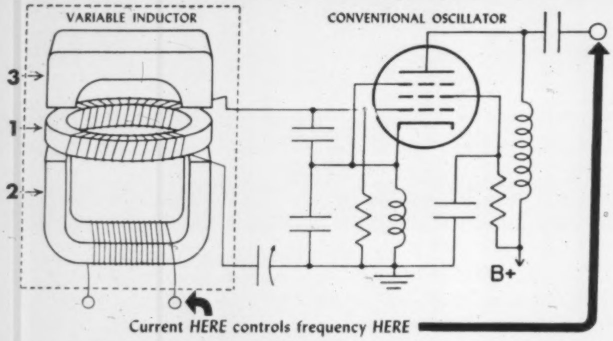
VARI-L
ELECTRICALLY
Variable Inductors



Current *HERE* controls frequency *HERE*

The above is a schematic representation of a "Vari-L" inductor in an oscillating circuit, the frequency of which can be varied over wide limits by passing current through the "Vari-L" control winding. The current can be **DC** for remote control, **saw-tooth** for sweep purposes, or **sine-wave AC** for frequency modulation. Control frequencies up to several hundred kilocycles per second can be accommodated. The principal parts of the variable inductor illustrated are: **1**, toroidal saturable-core signal coil—**2**, electromagnet control yoke—**3**, bias-and-tracking permanent magnet.

Various styles and types of standard "Vari-L" inductors are produced for frequencies from the audio region to above 100 megacycles. In addition many special models, either single or ganged in sets, are made to customer specifications.

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Weksler Thermometer
Western Elec. Inst.
Weston Elec. Inst.

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Barber-Colman Co.
Central Scientific Co.
Friez Instrument Div.
Johnson Service Co.
Physical Research Labs.
Powers Regulator Co.
Taylor Instrument Cos.

HYGRO-THERMOGRAPHS
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Bristol Co.
Central Scientific Co.
Foxboro Co.
Freas Glass Works
Friez Instruments Div.
Green, Henry J.
Instruments Corp.
Serdex, Inc.
Taylor Inst. Cos.
Testing Machines, Inc.

HYPSOMETERS
Central Scientific Co.
General Elec. Co.
Federal Telephone
G. M. Mfg. Co.
Kahl Scientific Inst.
Keuffel & Esser Co.
Lufkin Rule Co.
Victory Engr. Co.
Warren-Knight Co.

ICE WARNING, INDICATORS
Clevite-Brush
Goodyear Tire & Rubber Co.
Kollsman Inst. Div.
Manning, Maxwell & Moore
Serdex, Inc.

IGNITION VELOCITY METERS
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Hays Corp.
Illinois Testing Labs.
Kahn & Co.

ILLUMINATION CONTROLLERS
Autotron Co.
Betts & Betts
De-Tec-Tronic Labs.
Electronic Lab.
Electronic Prods. Co.
Fisher-Pierce
General Electric Co.
General Radio
G-M Labs.
Haledy Electronic Co.
Hermetic Sealing Corp.
Industrial Elect. Controls
Lumenite Electronic
Paragon Electric Co.
Robinette Co.
Rockwell Engr.
Superior Electric
Weston Elec., Inst. Corp.

ILLUMINATION INDICATORS
Alden Products
Bradley Laboratories
De-Jur-Amsco Corp.
Friez Instrument Div.
General Elec. Co.
G-M Labs.
International Std. Trading
Leeds & Northrup Co.
M. B. Mfg. Co.
Marion Elec. Inst.
Meters Inc.
Photovolt Corp.
Rockwell Engr.
Triplett Elec. Inst.
Weston Elec. Inst. Corp.

ILLUMINATION RECORDERS
Alden Products
Alfax Paper & Eng.
Brush Electronics
Electro-Tech Equip. Co.
Esterline-Angus Co.
Friez Instruments Div.
Gardner Lab.
General Elec. Co.
Leeds & Northrup
Rockwell Engr.
Streeter-Amet Co.

ILLUMINOMETERS, Macbeth
Friez Instrument Div.
Leeds & Northrup
Macbeth Corp.

IMMERSION LIQUIDS for Inspection of Glass & Quartz (Adjusted Indices)
Cargille, R. P.
Instrument Dev. Labs.
Michrochemical Services
Sheffield Corp.

IMPACT RECORDERS
Alden Products
Alfax Paper & Engg.
Analysis Sales Co.
Baldwin-Lima-Hamilton
Brush Electronics
Epic, Inc.
Gorrell & Gorrell
Hathaway Inst. Co.
Impact Register
Impact-O-Graph
M. B. Mfg. Co.
Testing Machines, Inc.
Thwing-Albert Inst. Co.

IMPACT TESTING MACHINES (See Testers & Testing Machine, Impact)

IMPREGNATING MACHINES
Red Point Products

INCLINOMETER TUBES
Aeromarine Inst. Co.
Fish-Schurman Corp.
Flett Laboratory
Helio Instrument
Moeller Inst. Co.
Phoenix Prec. Inst.
Precision Thermometer
Rieker Instrument
Trimount Inst. Co.

INCLINOMETERS,
Aeromarine Inst. Co.
Dwyer Mfg. Co.
Eclipse-Pioneer Div.
Edcliff Instruments
Engis Equipment
Ferner Co.
Fischer & Porter
Fish-Schurman Co.
Geier & Bluhm, Inc.
Kollsman Inst. Div.
Machlett & Son
Meriam Instrument
Moeller Inst. Co.
Rieker Inst. Co.
Precision Therm.
Ruehfel Co.
Schwein Engineering
Starrett Co.
Summers Gyroscope
Tejax Eng. Corp.
Trimount Inst. Co.
Warren-Knight Co.

INCLINOMETERS, Bore Hole
Edcliff Instruments
Sperry-Sun Well Surveying

INCLINOMETERS, Lateral (Aviation)
Aeromarine Inst. Co.
Builders-Providence
Eclipse-Pioneer Div.
Edcliff Instruments
Instr. Associates
Machlett & Son
Rieker Instrument
Schwien Engineering

INCLINOMETERS, Ship
American Hydromath
Edcliff Instruments
Geier & Bluhm, Inc.
Moeller Inst. Co.
Negus, T. S. & J. D.
Rieker Instrument

INDEXES, Base Volume & Base Pressure
American Meter Co.

INDICATOR LIGHTS (See also Dial Lights)
Dialight Corp.

INDICATORS, (See also the object of measurement and control)

INDICATORS, Detonation
Bliley Elec.
Century Geophysical
Eclipse-Pioneer Div.
Electro Products Labs.
Engineering Res. & Dev.
Photocon Research
Rowe Engineering
Rutico, Inc.
Sperry Gyroscope
Topp Industries Inc.
Trimount Inst. Co.

INDICATORS, Direction (Radioactuated)
Air Associates
Airborne Instruments
Collins Radio Co.
Eclipse-Pioneer Div.
Electronic Associates
Jarvis Electronics
Kollsman Instrument
Lear, Inc.
Marion Elec. Inst.
Polarad Electronics
Raytheon Mfg.
RCA Div.
Schwien Engg. Co.
Servo Corp. of America
Sperry Gyroscope Co.
Summers Gyroscope

INDICATORS, Engine
Aero Electronics
Aeromarine Inst. Co.
American Inst. Co.
Bacharach Industrial Inst.
Baldwin-Lima-Hamilton
Barbour-Stockwell
Bendix Aviation Corp.
Berkeley Scientific
Cambridge Inst. Co.
Commercial Research
Crosby Steam Gage Co.
Eclipse-Pioneer Div.
Edison Inc., Thomas A.
Electric Tachometer
Electro Products Labs.
Engelhard Inc., Charles
Federal Telegraph
GE Instrument Dept.
Hathaway Inst. Co.
Hickok Elec. Inst. Co.
International Std. Trading
Kollsman Inst.
Lewis Engineering
Marion Elec. Inst.
Marsh Corp.
Photocon Research
Rutico, Inc.
Skaneateles Mfg. Co.
Streeter-Amet Co.
Trimount Inst. Co.
Weston Elec. Inst.

INDICATORS, Engine Compression
Aero Electronics
Aeromarine Inst. Co.
Bacharach Industrial Inst.
Baldwin-Lima-Hamilton
Cambridge Inst. Co.
Commercial Research
Control Engineering
Electro Products Labs.
Instrument Lab. Inc.
Marsh Corp.
Photocon Research
RCA Div.
Schauer Mfg. Co.
Trimount Inst. Co.
U. S. Gauge

INDICATORS, Ignition Lag
Advanced Electronics Inc.
American Instrument
Bacharach Industrial Inst.
Bendix Aviation Corp.
Kahn & Co.

INDICATORS, Multiple Recording
Air Associates
Airborne Instruments
Alden Products
Alfax Paper & Engg.
Authorized Mfrs. Serv.
Bristol Co.
Brush Electronics Co.
Commercial Research
Eclipse-Pioneer Div.
Fielden Instrument
Fischer & Porter
Gotham Inst. Div.
Hays Corp.
Kybernetes Corp.
Larson Instrument
Leeds & Northrup
Mason-Neilan Regulators
Matisa Equipment
Minneapolis-Honeywell
Penn Ind. Inst. Corp.
Robertshaw-Fulton Co.
Taylor Instrument Cos.
Thwing-Albert Inst. Co.
Weston Elec. Inst.

INDICATORS, Rate of Climb
Aeromarine Inst. Co.
Automatic Temp. Control
Eclipse-Pioneer Div.
Instr. Associates
Kollsman Inst.
Mason-Neilan Co.
Norden-Ketay Corp.
Rieker Inst. Co.
Summers Gyroscope
U. S. Gauge

INDICATORS, Sight Flow
Bausch & Lomb
Bowser, Inc.
Brooks Rotameter Co.
Builders-Providence
Fischer & Porter
Jacoby-Tarbox Corp.
Jerguson Gage & Valve
King Engr. Corp.
Phoenix Precision Inst.
Republic Mfg.
Sarco Co.
SCAM Instrument Corp.
Schutte & Koerting Co.
Shand & Jurs
Trinity Equipment

INDICATORS, Sound
Aircraft Electronics
Amperite Corp.
Anco Inst. Div.
Bristol Engg. Corp.
Brush Electronics Co.
Clough-Brengle Co.
Daven Co.
Dyna-Labs.
Erwood, Inc.
Feiler Engineering
General Elec. Co.
General Radio
Imperial Brass
Kay Electric
Marion Electrical Inst.
Massa Labs. Inc.
Minnesota Electronics
Panoramic Radio Products
Polarad Electronics
RCA
Reed Research
SCAM Instrument Corp.
Scott, Inc., Hermon H.

INDICATORS, Time Interval (See Timers, Automatic, Interval)

INDUCTANCE METERS
Aerovox Corp.
Boonton Radio Corp.
Electronic Dev. Lab.
Federal Telephone
Feiler Engineering
Freed Transformer
General Elec. Co.
General Electronic
General Radio
Industrial Instruments
Industrial Test Equip.
Leeds & Northrup Co.
Marconi Instruments
Premier Research
Rubicon Co.
Shallcross Mfg. Co.
Sickles Co.
Sierra Electronic Corp.
United Transformer Corp.
Weston Elec. Inst.

INDUCTORS (See also Transformers)
Vari-L Co.

INSPECTION, Glass & Quartz. (See Immersion Liquids)

INSPECTION DEVICES, AUTOMATIC, Color
Austin Co.
ConRay Corp.
Electric Eye Equip.
Electric Sorting Machine
Gardner Laboratory
GE Instrument Dept.
Huggins Labs.
Instrument Dev. Labs.
Kaye Development
Macbeth Corp.
Menlo Research Lab.
Sheffield Corp.
Swedish Gage Co.
Telechrome, Inc.

INSPECTION DEVICES, AUTOMATIC, Concentricity
Arlin Products
Autotron Co.
ConRay Corp.
DoAll Co.
Electric Eye Equip.
Engis Equipment
Federal Prod. Corp.
Fielden Instrument
Industrial Electronics
Magnaflux Corp.
Martin-Hubbard Corp.
Moore Products
Perkin-Elmer Corp.
Pratt & Whitney
Robertshaw-Fulton Co.
Sheffield Corp.
Size Control Co.
Standard Elec.
Stocker & Yale
Swedish Gage Co.
Whittington Pump

INSPECTION DEVICES, AUTOMATIC, Cylindricality
Arlin Products
ConRay Corp.
Electric Eye Equip.
Engis Equipment
Federal Products Corp.
Industrial Electronics
Martin-Hubbard Corp.
Moore Products
Nuclear Research
Pratt & Whitney
Robertshaw-Fulton Co.
Sheffield Corp.
Size Control Co.
Stocker & Yale
Swedish Gage Co.
Taft-Peirce

INSPECTION DEVICES, AUTOMATIC, Diameter
Airborne Instruments
Arlin Products
Berkshire Laboratories
Cleveland Inst.
ConRay Corp.
DoAll Co.
Electric Eye Equip.
Federal Products Corp.
Gaertner Scientific Corp.
Graham-Mintel Inst.
Industrial Electronics
Industrial Gauges Corp.
Martin-Hubbard Corp.
Moore Products
Poole Instruments
Pratt & Whitney
Robertshaw-Fulton Co.
Rockwell Eng'ng
Rowe Engineering
Sheffield Corp.
Size Control Co.
Standard Elec.
Stocker & Yale
Swedish Gage Co.
Taft-Peirce

INSPECTION DEVICES, AUTOMATIC, Dimensions
Aero Electronics
Airborne Instruments
Arlin Products
Arma Corp.
Autotron Co.
Berkshire Laboratories
ConRay Corp.
Control Devices Inc.
Daytronic Corp.
DoAll Co.
Electric Eye Equip.
Electronic Control Sys. Inc.
Federal Products Corp.
Gaertner Scientific Corp.
Graham-Mintel Inst.
Hanson-Gorrill-Brian
Hillyer Inst.
Industrial Electronics
Kahn & Co .
Magnaflux Corp.
Martin-Hubbard Corp.
Metron Instrument
Moore Products
National Broach & Mach.
Nuclear Research Corp.
Pratt & Whitney
Rea Company
Robertshow-Fulton Co.
Rockwell Engr.
Sheffield Corp.
Size Control Co.
Stocker & Yale
Swedish Gage Co.
Taft-Peirce
Telectronics Lab.

INSPECTION DEVICES, AUTOMATIC, Electrical
ACF Electronics Div.
Aero Electronics
Airborne Instruments
American Electronics Labs.
Arlin Prods.
Associated Research, Inc.
Authorized Mfrs. Serv.
Barnes Devel. Co.
Berkshire Laboratories
Bogue Electric Mfg. Co.
Clarke Inst. Corp.
Clippard Inst. Lab.
Communications Meas. Lab.
ConRay Corp.
Control Eng'ng.
Daystrom Inst.
Devtronics, Inc.
Dice Co., J. W.
Dit-Mco, Inc.
DoAll Co.
Doelcam Div.
Eder Inst. Co.
Electric Eye Equipment
Electronic Dev. Lab.
Electronic Meas. Co.
Electro-Products Lab.
El Mec Labs.
Farnsworth Electronics
Federal Telephone
Feiler Engineering
Freed Transformer Co.
General Elec. X-Ray Corp.
Griswold Mfg. Co.
Hanson-Gorrill-Brian
Hillyer Instrument
Industrial Control Panel
Industrial Engineering
Industrial Inst. Inc.
Industrial Test
Industrial Timer Corp.
Kahn & Co.
Kaye Development
Larson Instrument
Martin-Hubbard Corp.
Nankervis Co., G. L.
Non-Linear Systems
Peschel Electronics
Poole Instruments
Pratt & Whitney
Radiaphone
Robertshaw-Fulton Co.
Rockwell Engr.
Servomechanisms Inc.
Sheffield Corp.
Size Control Co.
Sperry Products
Sunshine Scientific
Thordarson-Meissner
Union Switch
Whittington Pump
Wilmotte, Inc.
General Electric
Gogan Machine
Hacker & Co., W. J.
Hygrotester Inc.
Magnaflux Corp.
Magnetic Analysis Corp.
Miller Corp., Wm.
Olsen Testing Machine
Pacific Scientific
Rowe Engineering
Steel City Testing
Swedish Gage Co.
Torsion Balance Co.

INSPECTION DEVICES AUTOMATIC, Hardness
Arlin Products
Barber-Colman
Brabender Corp.
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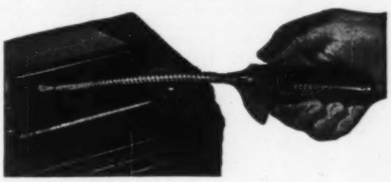

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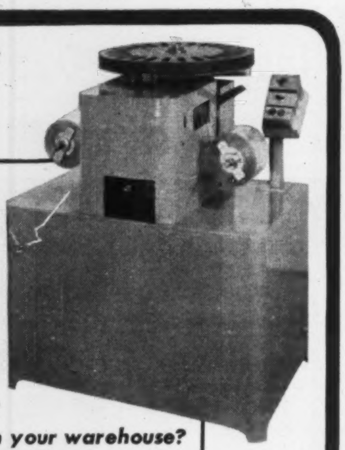

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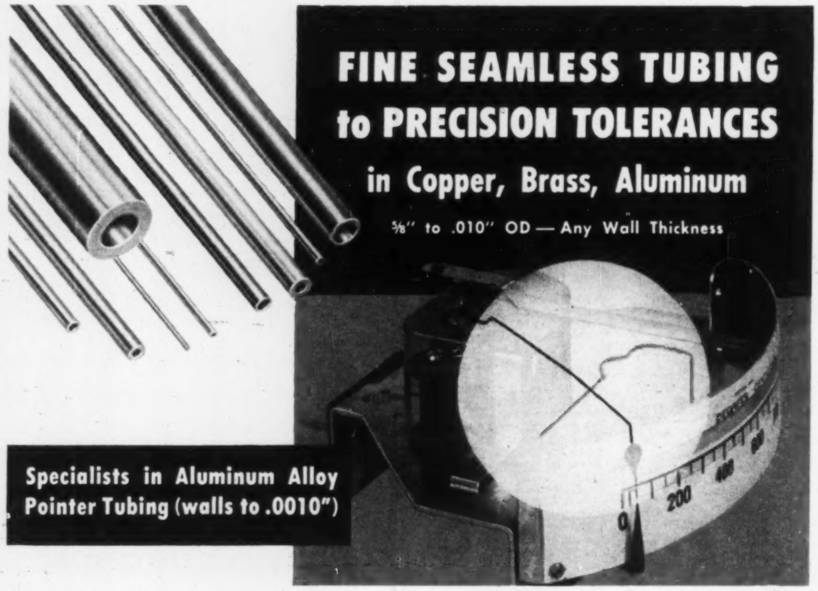

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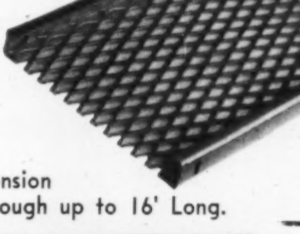

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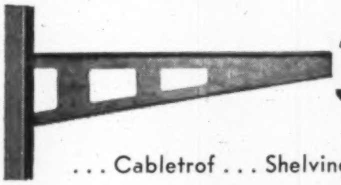

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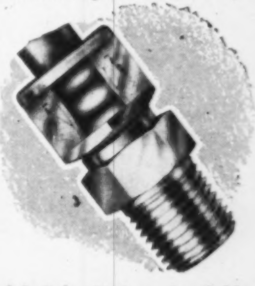

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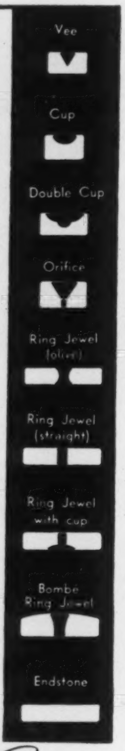

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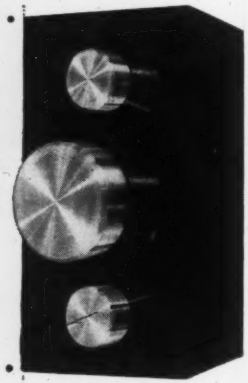

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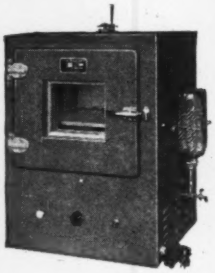

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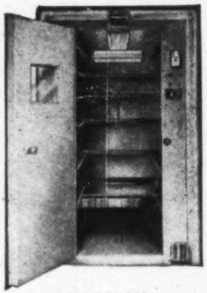

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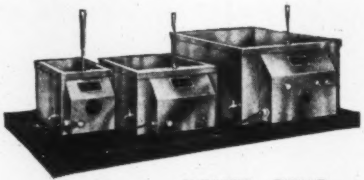

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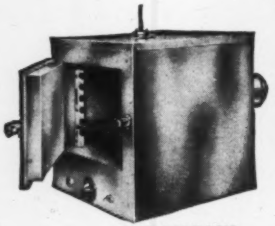

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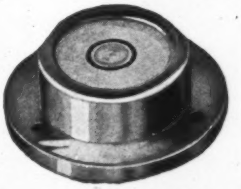

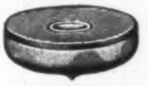

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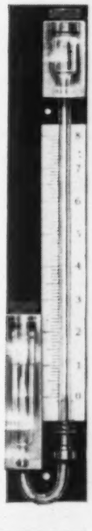

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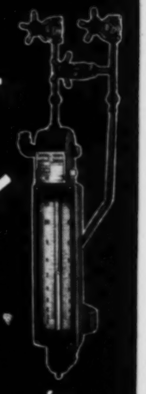

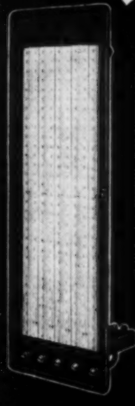

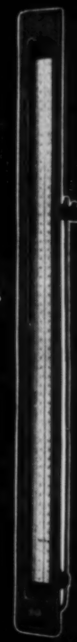

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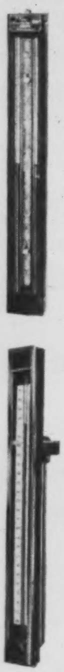

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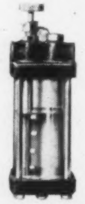

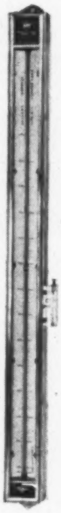

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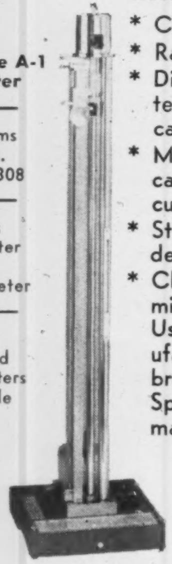

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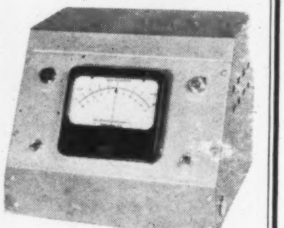

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Ideal Lab. Tool
King Engineering
Kontes Glass Co.
Liquidepth Indicators
Meriam Inst. Co.
Minneapolis-Honeywell
National Inst. Labs.
Penn Indus. Inst. Co.
Phoenix Precision Inst.
Porter, George K.
Precision Therm.
Refinery Supply
Scientific Inst. Co.
Simplex Valve & Meter
Trimount Inst. Co.
Uehling Inst. Co.
Universal X-Ray Prods.
Victory Eng'ng Corp.
Wallace & Tiernan

MANOMETERS, U-tube, Electric Transmitting

Bailey Meter Co.
Bristol Co.
Builders-Providence
Ellison Draft Gage
Electronic Products Co.
Fielden Instrument
General Instrument Co.
Gorrell & Gorrell
Ideal Lab. Tool
Magnetrol Inc.
Minneapolis-Honeywell
Penn Indus. Inst. Div.
Phoenix Precision Inst.
Precision Therm.
Radiation Counter Labs.
Republic Flow Meters
Shand & Jurs Co.
Simplex Valve & Meter
Taylor Inst. Cos.
Trerice Co.
Trimount Inst. Co.
Uehling Inst. Co.

MANOMETERS, U-tube, Glass

Ace Glass Inc.
Acme Glass, Inc.
American Inst. Co.
American Meter Co.
Ann Arbor Inst. Works
Annis Co.
Bacharach Industrial Inst.
Barton Inst. Co.
Bellco Glass, Inc.
Bethlehem Apparatus
Builders-Providence
Central Scientific
Consolidated Vacuum Corp.
Continental Equip. Co.
Corning Glass Works
Distillation Products
Dwyer Mfg. Co.
Electronic Products
Ellison Draft Gage
Fischer & Porter
Fish-Schurman Co.
Fisher Scientific
Flett Lab.
Fredericks Co., Geo.
Friedrich & Dimmock
General Instrument
Glass Instruments
Gorrell & Gorrell
Gotham Instrument
Gray Instrument
Greiner Glassblowing Lab.
Hass Brothers Inst. Co.
Hays Corp.
H-B Instrument
Howe & French, Inc.
Ideal Lab. Tool
Kimble Glass Co.
King Engr.
Kontes Glass Co.
Laboratory Equipment Co.
Liquidepth Indicators
Macalaster Bicknell Co.
Machlett & Son
Manning, Maxwell & Moore
Martin & Co.
Meriam Instrument
Mine Safety Appliances
Moeller Instrument Co.
Phipps & Bird
Phoenix Precision Inst.
Podbielniak, Inc.
Precision Scientific
Precision Thermometer
Rascher & Betzold
Refinery Supply Co.
Reiker Instrument
Republic Flow Meters
Sargent & Co., E. H.
Scientific Glass App.
Scientific Inst. Co.
Shand & Jurs
Simplex Valve & Meter
Specialty Glass Co.
Superior Meter Co.
Trerice Co.
Trimount Inst.
Uehling Inst. Co.
Uhrig Co., Joseph F.
Universal X-Ray Products
Vapor Recovery Systems
Wakefield Industries
Welch Scientific
Weston Elec. Inst.
Wilkens-Anderson Co.

MANOMETERS, U-tube, Metal
American Meter Co.
Barton Inst. Co.
Bethlehem Apparatus
Cambridge Inst. Co.
Ellison Draft Gage
Foxboro Co.
Griebel Co.
Ideal Lab. Tool
King Engineering
Liquidepth Indicators
Mason-Neilan Regulator
Minneapolis-Honeywell
Penn Industrial Inst.
Precision Scientific
Precision Therm. & Inst.
Scientific Inst. Co.
Simplex Valve & Meter
Superior Meter
Taylor Inst. Cos.
Trimount Inst. Co.
Uehling Inst. Co.
Universal X-Ray Prods.

MAP MAKING PROJECTORS
Abrams Instrument
Aero Electronics
American Optical
Bausch & Lomb Optical
Beseler Co., Charles
Fish-Schurman Corp.
Gordon Enterprises
Opplem Co., Inc.
Thwing-Albert Inst. Co.
Wild Heerbrugg Inst.

MAP MEASURES
Aero Electronics
Dietzgen Co., Eugene
Gordon Enterprises
Hamilton Watch
Hand & Sons
Hastings Inst. Co.
Keuffel & Esser
LaPine & Co.
Scope Instrument
Serdex, Inc.
United States Blue Print
Weber & Co., F.
White Co., Inc., David

MARINE INSTRUMENTS, (See Nautical Instruments)

MARINE INSTRUMENTS
Gyro-Compass & Gyro-Pilot, Electro-Mechanical Steering Systems
Arma Corporation
Bendix Aviation Corp.
Bogue Elec. Mfg. Co.
Cardwell Mfg. Corp.
Doelcam Div.
Eclipse-Pioneer Div.
Henschel Corp.
Sperry Gyroscope Co.
Summers Gyroscope
U. S. Instrument Corp.
Vectron, Inc.

MARKERS, Pipe and Wire
Acromark Co.
Brady Co., W. H.
Stafford Co.

MASTER CLOCKS (See Clocks, Master)

MEASURING MACHINES, Linear
Adde & Co.
Advance Electronics
Aero Electronics
American Meas. Insts.
Ann Arbor Inst. Works
Arizona Tool & Die Co.
Bausch & Lomb
Bowen & Co.
Brush Electronics
Bushnell Optical
Coleman Engr.
Counter & Control Corp.
Durant Mfg. Co.
Electronic Control Systems, Inc.
Engis Equip.
Ercona Corp.
Federal Products Corp.
Ferner Co.
Fidelity Mach. Co.
Gaertner Scientific Corp.
Griswold Mfg. Co.
Gurley, W. & L. E.
Hamilton Watch
Hillyer Inst.
McDonald Odometer
Lufkin Rule
Potter Instrument
Pratt & Whitney
Production Instrument
Scherr Optical Tool
Sheffield Corp.
Stocker & Yale
Veeder-Root, Inc.
Wilson & Co., G. C.
Zeiss, Inc., Carl

MEASURING MACHINES, Wire
Adde & Co.
Counter & Control Corp.
Durant Mfg. Co.
Engis Equipment
Ercona Corp.
Federal Products Corp.
Federal Telephone
Ferner Co.
Kellogg Switchboard
Minneapolis Elec. & Const.
Potter Instruments
Pratt & Whitney
Scherr Co., Inc.
Sheffield Corp.
Standard Elec.
Stocker & Yale

MEGOHMMETERS
American Inst. Co.
Am. Paulin System
Associated Research
Biddle Co., Jas. G.
Brush Electronics
California Magnetic
Cambridge Inst. Co.
Chicago Ind. Inst.
Cincinnati Div.
Clippard Inst. Lab.
Clough-Brengle Co.
Dice Co., J. W.
Dit-Mco, Inc.
Electronic Dev. Lab.
Electro-Mec Lab.
Electro Products Lab.
Electro-Tech Equip.
El-Tronics Inc.
Federal Telephone & Radio
Feiler Enginering
Freed Transformer
General Elec. Co.
General Radio Co.
Hermetic Sealing Corp.
Ill. Testing Labs.
Industrial Instruments
Kahn & Co.
Keithley Instruments
MacLeod & Hanopol
Martindale Electric Co.
Measurements Corp.
Meters, Inc.
Niagara Elec. Inst.
Phaostron Co.
Physics Research
Precise Measurements
Precision Apparatus
Radio City Products
Rawson Electrical Inst.
Reiner Electronics
Scientific Specialties
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
Southwestern Ind. Elec.
Sticht Co.
Technology Instrument
Triplett Elec. Inst.
Western Radiation Lab.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

MEGOHM VOLTMETERS (See Voltmeters, Megohm)

MELTING POINT APPARATUS
Ace Glass, Inc.
American Inst. Co.
Central Scientific Co.
Corning Glass Works
Ferner Co.
Fisher Scientific Co.
Greiner Glassblowing Lab.
Hacker & Co., W. J.
Humboldt Mfg. Co.
Koehler Inst. Co.
Kontes Glass Co.
Machlett & Son
Martin & Co.
Microchemical Service
National Inst.
Pacific Transducer Corp.
Parr Instrument Co.
Pfaltz & Bauer, Inc.
Precision Scientific Co.
Scientific Glass Apparatus
Thwing-Albert Inst. Co.
Weston Elec. Inst.

MEMORY Drums, Cores, Tapes
ACF Electronics Div.
Authorized Mfrs. Serv.
Avion Div.
Burroughs Corp.
Computer Control Co.
Davies Labs, Inc.
Electro-Data Corp.
Epsco, Inc.
Gulton Mfg. Corp.
Logistics Research Inc.
Magnetics, Inc.
North American Inst.
Pratt & Whitney
Potter Inst. Co.
Rea Co. Inc., J. B
Remington Rand

METAL DETECTORS (See Detectors, Metal)

METALLIC BELLOWS (See Bellows, Metallic)

METALS, Thermostatic
Acro Switch Div.
Baker & Co., Inc.
Bar-Ray Products, Inc.
Chace Co.
General Plate
H-B Instrument Co.
Metal Goods Corp.
Wilson Co., H. A.

METEOROLOGICAL INSTRUMENTS
Aero Electronics
American Paulin
Beckman & Whitley
Cardwell Mfg. Co.
Cook Electric
Ferner Co.
Friez Inst. Div.
General Elec. Co.
Georator Corp.
G. M. Mfg. Co., Inc.
Gorrell & Gorrell
Green, Henry J.
Gurley, W. & L. E.
H-B Inst. Co.
Instruments Corp.
Kahl Scientific Inst.
Kollsman Instrument
Moeller Instrument Co.
Physical Research
Precision Therm.
Serdex, Inc.
Stewart, M. C.
Taylor Inst. Cos.
United Scientific Co.
Wallace & Tiernan
Weksler Thermometer
Welch Scientific
White Co.

METER LEVELING SADDLES
American Meter Co.
Commercial Iron Wks.
Robinson Orifice Fitting

METER PROVERS, Gas
American Meter Co.
Lambert Meter Co.
Superior Meter Co.

METER STICKS
Lufkin Rule Co.
Weber Co.
Welch Scientific

METERS, Acid (See Acidimeters)

METERS, Ampere Hour (See Ampere Hour Meters)

METERS, Batching
American Instrument
Bowser, Inc.
Brooks Rotameter Co.
Buffalo Meter Co.
Builders-Providence
Cal-Tronics Corp.
Electrical Develop.
Fischer & Porter
Foxboro Co.
Hetherington & Berner
Neptune Meter Co.
Penn Indus. Inst. Co.
Rockwell Mfg. Co.
Smith Corp., A. O.
Sparling Meter Co.
Streeter-Amet
Thayer Scale & Eng'ng.

METERS, Coal (See Coal Meters)

METERS, Coin Operated
American Meter Co.
Electro-Voice, Inc.
General Elec. Co.
International Register
Landis & Gyr, Inc.
Rhodes, Inc., M. H.
Superior Meter Co.

METERS, Compressed Air
American Meter Co.
Bailey Meter Co.
Builders-Providence
Fischer & Porter
Hays Corp.
Mason-Neilan Regulator
N. J. Meter
Penn Industrial Inst.
Republic Flow Meter
Schutte & Koerting
Simplex Valve & Meter
Taylor Inst. Cos.

METERS, Condensation
Bailey Meter Co.
Buffalo Meter Co.
Fischer & Porter
Henszey Co.
Penn Indus. Inst. Co.
Sparling R. W.
Taylor Inst. Cos.

METERS, Conductivity (See Conductivity Meters)

METERS, Consumer's Electric
GE Apparatus Sales
Landis & Gyr
Sangamo Electric
Westinghouse Elec.

METERS, Consumer's, Gas
American Meter Co.
Lambert Meter Co., Inc.
Penn Industrial Inst.
Rockwell Mfg. Co.
Superior Meter Co.

METERS, Counting Rate
Advance Electronics
Atomic Instrument
Automatic Temp. Control
Berkeley Scientific
Bristol Co.
Daystrom Inst.
Detectolab, Inc.
Detectron Co.
Douglas Instrument Labs.
Electrical Develop.
General Radio
Georator Corp.
I-L-S Instrument
MacDonald Co., W. S.
NRD Instrument
Nuclear Chicago
Nuclear Measurements
Nuclear Research Corp.
Nucleonic Corp.
Potter Instrument
Radiation Counter Labs.
Radiation Inst. Dev. Lab.
Radioactive Products
R-C Scientific Inst.
Revere Corp.
Sangamo Electric
Scientific Specialties
Standard Elec. Time
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Tracerlab
Walkirt Co.
Wang Labs.
Western Radiation Lab.
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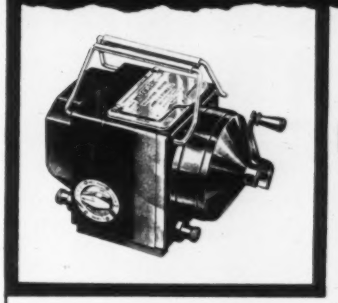

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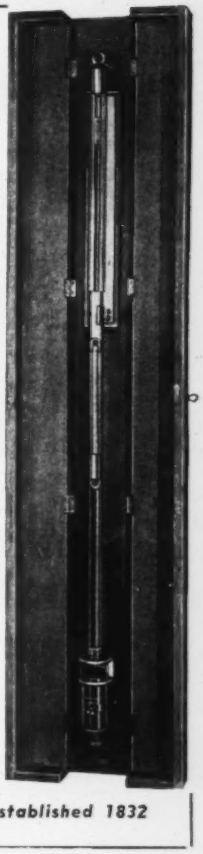

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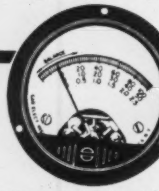

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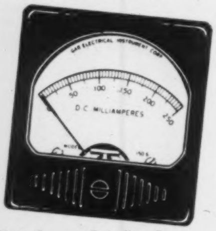

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☐ Please send us literature on your Meters.

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Company_________________________________

Address_________________________________

City_______________Zone_____State_______

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METERS, Current, Air & Gas
American Meter Co.
Assembly Products
Bristol Co.
Builders-Providence
Commercial Research
Electrical Develop.
Fischer & Porter
H D Electric Co.
Kahl Scientific Inst.
Mason-Neilan Regulator
Minneapolis-Honeywell
Penn Industrial Inst.
Schutte & Koerting
Sensitive Research Inst.

METERS, Current, Liquid
American Meter Co.
Badger Meter Mfg. Co.
Bowser & Co.
Bristol Co.
Builders-Providence
Commercial Research
Eclipse Aviation
Fischer & Porter
G. M. Mfg. Co.
Gurley, W. & L. E.
Keuffel & Esser Co.
Leupold & Stevens
Manning, Maxwell & Moore
Mason-Neilan Regulator
Mil Instrument Corp.
Minneapolis-Honeywell
National Meter Co.
Neptune Meter Co.
Northwest Instrument
Schutte & Koerting
Scientific Inst. Co. (Calif.)
Sensitive Research Inst.
Sparling, R. W.
Texas Instruments
Uehling Instrument Co.
Worthington Pump

METERS, Decibel (See Sound Level Meters)

METERS, Demand, Electric
Associated Research
Automatic Elec. Chicago
Bailey Meter
Burlington Inst. Co.
Duncan Elec. Mfg.
Electric Indicator Co.
Electrical Develop.
Esterline-Angus Co.
GE Apparatus Sales
HD Elec. Co.
Landis & Gyr. Inc.
Metrotype Corp.
Sangamo Electric Co.
Streeter-Amet
Triplett Elec. Inst.
Westinghouse Elec.

METERS, Demand, Gas
American Meter Co.
Bailey Meter Co.
Bendix Marine Products
Lambert Meter Co.
Mason Neilan Regulator
Penn Industrial Inst.
Streeter-Amet
Superior Meter Co.

METERS, Demand Limiting, Automatic
American Meter Co.
Annis Co.
Bristol Co.
Esterline-Angus Co.
GE Apparatus Sales
Landis & Gyr, Inc.
Mason-Neilan Regulator
Westinghouse Elec. & Mfg.

METERS, Distortion
Advance Electronics
Audio Instrument
Brush Electronics
Empire Devices
Federal Telephone
General Electronic
General Radio Co.
Hewlett-Packard
Industrial Test Equip.
Kay Electric
Marconi Instruments
RCA Div.
Scott, Inc., Hermon
Sierra Electronic Corp.

METERS, Earth Current
Associated Research
Biddle Co., James G.
Borden Engineering
Bristol Co.
Federal Telephone
Georator Corp.
Heiland Div.
Marconi Instruments
Miller, M. C.
Physics Research
Rawson Electrical Inst.
Shallcross Mfg. Co.
Triumph Mfg. Co.
United Optical Mfg.
Westinghouse Elec.

METERS, Electronic
Aero Instrument
Advance Electronics
Advanced Electronics
Air-O-Tronics
American Chronoscope
Arga Division
Associated Research
Authorized Mfrs. Service
Automatic Temp. Control
Baldwin-Lima-Hamilton
Ballantine Labs.
Berkeley Scientific Div.
Boonton Radio Corp.
Bristol Co.
Brush Electronics
Chicago Industrial
Co-design Corp.
Computer Co. of America
Daven Co.
Deltron, Inc.
Doelcam Div.
Donner Scientific
Electrical Develop.
Electronic Associates
Electronic Instrument
Electronic Meas. Co.
Fielden Instrument
Fischer & Porter
Fluke Mfg.
Furst Electronics
General Electric
General Electronic
General Radio
Hays Corp.
Hewlett-Packard
Industrial Electronics
Industrial Test Equip.
Jackson Co., Byron
Jersey City Tech. Lab.
Kahn & Co.
Kay Electric
Kay-Lab.
Keithley Instruments
Lavoie Labs.
Lectronic Research Labs
Marconi Instruments
Measurements Corp.
Millivac Instruments
Non-Linear-Systems
Penn Industrial Inst. Corp.
Phaostron Co.
Precision Apparatus
Radiation, Inc.
Scott, Inc., Herman H.
Shasta Div.
Sierra Electronic Corp.
Simpson Elec. Co.
Special Instruments Lab.
Standard Elec. Time
Sunshine Scientific
Superior, Inc.
Sylvania Elec. Prod.
Technology Insts.
Trio Labs.
Waveforms, Inc.
Westport Electric
Wheelco Div.

METERS, Flow (See Flowmeters)

METERS, Fluorescence
Beckman Instruments
Coleman Electric
Farrand Optical
Pfaltz & Bauer
Phoenix Precision Inst.
Photovolt Corp.
Potter Aeronautical Co.
R-C Scientific Inst.

METERS, Footage (See Counters, Footage)

METERS, Foot-candle (See Foot-candle Meters)

METERS, Frequency (See Frequency Meters)

METERS, Gas (See Gas Meters)

METERS, Gas, Dry Test
American Meter Co.
Hagan Corp.
Industrial Inst.
Lambert Meter Co.
Minneapolis-Honeywell
Republic Flow Meters
Rockwell Mfg.
Superior Meter Co.
Weston Elec. Inst.

METERS, Gas, Integrating
American Meter Co.
Bailey Meter Co.
Bristol Co.
Brooks Rotameter Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
Hagan Corp.
Industrial Inst.
Lambert Meter Co.
Mason-Neilan Regulator
Minneapolis-Honeywell
Penn Ind. Inst. Div.
Republic Flow Meters
Rockwell Mfg. Co.
Schutte & Koerting
Superior Meter Co.
Taylor Inst. Cos.

METERS, Gas, Wet Test
American Meter Co.
Labline, Inc.
Lambert Meter Co.
Minneapolis-Honeywell
Precision Scientific
Superior Meter Co.
Taylor Inst. Cos.
Weston Elec. Inst.

METERS, Gas, Station
American Meter Co.
Bowser & Co.
Industrial Inst.
Smith Corp., A. O.

METERS, Gasoline (See Meters, Liquid)

METERS, High Pressure & High Pressure Distribution
American Meter Co.
Baldwin-Lima-Hamilton
Barton Instrument
Bowser, Inc.
Bristol Co.
Brodie Co., Ralph
Buffalo Meter
Builders-Providence
Fischer & Porter
Foxboro Co.
Gilmore Industries
Hagan Corp.
Hobbs Corp.
Manning, Maxwell & Moore
Moore Products Co.
Penn Ind. Inst. Corp.
Republic Flow Meters
Revere Corp.
Rockwell Mfg.
Simplex Valve & Meter
Schutte & Koerting
Smith Corp., A. O.
Sprague Meter Co.

METERS, Hydrogen Ion (See Hydrogen Ion Determination Instruments)

METERS, Impedance
Advance Electronics
Beckman Insts.
Boonton Radio Corp.
Federal Telephone
F.R. Machine Works
General Electronic
General Radio
Hycon Mfg. Co.
Industrial Test Equip.
Kay Electric Co.
Lavoie Labs.
Marconi Instruments
Narda Corp.
Penn Industrial Inst.
Shasta Div.
Sperry Gyroscope Co.
Sunshine Scientific
Technology Instrument

METERS, LIGHT (See Foot-candle Meters, Illumination Indicators and Recorders, Light Meters, etc.)

METERS, Liquid, Volumetric Types, Nutating Piston or Disk
Askania Regulator Co.
Badger Meter Co.
Bowser, Inc.
Brodie Co.
Buffalo Meter Co.
Hays Corp.
Henszey Co.
Hetherington & Berner
Neptune Meter Co.
Proportioneers, Inc.
Revere Corp.
Rockwell Mfg.
Worthington Pump

METERS, Liquid Volumetric Types, Oscillating Piston
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Brodie Co., Ralph N.
Hetherington & Berner

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Lapp Insulator
Neptune Meter Co.
Proportioneers, Inc.
Rockwell Mfg. Co.

METERS, Liquid, Volumetric Types, Propeller
Badger Meter Mfg. Co.
Builders-Providence
Fischer & Porter
G. M. Mfg. Co.
Henszey Co.
Neptune Meter Co.
Potter Aeronautical
Proportioneers, Inc.
Rockwell Mfg.
Sparling R. W.
Waugh Engineering
Westport Electric

METERS, Liquid, Volumetric Types, Reciprocating Piston
Askania Regulator Co.
Bowser Inc.
Brodie Co.
Proportioneers, Inc.
Rockwell Mfg.

METERS, Liquid, Volumetric, Rotary Piston
Askania Regulator Co.
Badger Meter Co.
Bowser, Inc.
Brodie Co., Ralph
Hetherington & Berner
Proportioneers, Inc.
Revere Corp.
Rockwell Mfg.
Smith Meter Co.

METERS, Liquid, Volumetric, Special for Extremely Low Flow
Askania Regulator Co.
Bowser Inc.
Brodie Co., Ralph N.
Brooks Rotameter
Commercial Research
Fischer & Porter
Foxboro Co.
G. M. Mfg. Co.
Hays Corp.
Jarco Services
Lapp Insulator
Neptune Meter Co.
Phoenix Precision Inst.
Potter Aeronautical
Ramapo Engr. Co.
Schutte & Koerting
Taylor Inst. Cos.
Technical Equipment Co.
Yellow Springs Inst.

METERS, Liquid, Weighing
Baldwin-Lima-Hamilton
Bowser, Inc.
Commercial Research
Electrical Develop.
Engineering Res. & Dev.
Gilmore Industries
Maxon Corp.
Nuclear Research
Phoenix Precision Inst.
Proportioneers, Inc.
Richardson Scale Co.
Thayer Scale & Eng'ng.
Trimount Instrument
Uehling Instrument
Virginia Electronics

METERS, Mach., Digital
Coleman Engr.
Landis & Gyr
Metrotype Corp.

METERS, Mileage
Barbour-Stockwell Co.
Eclipse-Pioneer Div.
Electrical Develop.
Engineering Res. & Dev.
Engler Inst. Co.
Jaeger Watch Co.
Ohmer Register
Sangamo Electric Co.
Speedometer Electric
U. S. Taximeter
Veeder-Root, Inc.

METERS, Multi-rate
Brooks Rotameter Co.
Sangamo Electric

METERS, Oil (See Meters, Liquid)

METERS, Orifice (See Flowmeters, Orifice)

METERS, Oxygen (See 1—Gas Analyzer; 2—Gas Meters)

METERS, pH (See pH Meters)

METERS, Phase Angle (See Phase-Angle Meters)

METERS, Pitot Tube (See Flowmeters, Pitot Tube)

METERS, Positive Displacement (See Gas Meters, Positive; and Liquid Meters, Volumetric)

METERS, Prepayment
American Meter Co.
General Electric Co.
Landis & Gyr. Inc.
Sangamo Electric Co.
Superior Meter

METERS, Proportional
American Meter Co.
Bailey Meter Co.
Berkeley Scientific
Bristol Co.
Bowser, Inc.
Doelcam Div.
Fischer & Porter
Foxboro Co.
Lapp Insulator
Mason-Neilan Regulator
Minneapolis-Honeywell
Proportioneers, Inc.
Republic Flow Meters
Schutte & Koerting
Taylor Inst. Cos.
Thayer Scale & Eng'ng.

METERS, Reactive Component
Boonton Radio Corp.
Bristol Co.
Esterline-Angus Co.
GE Apparatus Sales
Industrial Test Equip.
Landis & Gyr Inc.
Physics Research
Potter Aeronautical
RCA Div.
Sangamo Electric
Technology Instruments
Triplett Elec. Inst.
Westinghouse Elec.
Weston Electrical Inst.

METERS, Rotary Displacement
Askania Regulator Co.
Bowser Inc.
Brodie Co., Ralph
Coleman Engr.
Doelcam Div.
Engis Equipment
Henszey Co.
Industrial Electronics
Industrial Inst.
Revere Corp.
Rockwell Mfg. Co.
Roots-Connersville Co.
Smith Corp., A. O.
Thayer Scale & Eng'ng.

METERS, Sewage
American Meter Co.
Bailey Meter Co.
Bristol Co.
Builders-Providence
Fischer & Porter
Foxboro Co.
Hagan Corp.
Hays Corp.
Leupold & Stevens
Mason-Neilan Regulator
Minneapolis-Honeywell
Penn Industrial Inst.
Republic Flow Meters
Rockwell Mfg.
Simplex Valve & Meter
Taylor Inst. Cos.

METERS, Shunt
Associated Research
Beede Elec. Inst. Co.
Brooks Rotameter Co.
Builders-Providence
Burlington Inst. Co.
Columbia Elec. Mfg.
Dale Instruments
Daven Co.
Electronic Development
Fischer & Porter
Instrument Resistors
Penn Industrial Inst.
Phaostron Co.
Radio City Products
Rawson Electrical Inst.
Reiner Electronics
Roller-Smith
Sangamo Electric
Shallcross Mfg.
Westinghouse Elec.

METERS, Sight Flow
Bowser Inc.
Brooks Rotameter Co.
Builders-Providence
Commercial Research
Fischer & Porter Co.
Henszey Co.
Jacoby-Tarbox Corp.
Podbielniak, Inc.
Schutte & Koerting
Selas Co.
Trimount Inst.
Uehling Inst. Co.

METERS, Station
American Meter Co.
Bristol Co.
GE Apparatus Sales
Rockwell Mfg. Co.
Sangamo Electric

METERS, Steam (See Flowmeters, Steam)

METERS, Time
Advance Electronics
Aero Instrument Co.
Alina Corp.
Amer. Chronoscope
Barbour Stockwell Co.
Berkeley Scientific
Betts & Betts
Bristol Co.
Bristol Motor Div.
Brush Electronics
Burlington Instrument
Cramer Co., Inc.
Cyclotron Specialties
DeJur Amsco
Dimco-Gray Corp.
Doelcam Div.
Elec. Tachometer Corp.
Engler Inst. Co.
GE Apparatus Sales
Gorrell & Gorrell
Hamilton Watch
Haydon Co., A. W.
Haydon Mfg. Co.
Hobbs Corp., J. W.
Industrial Timer Corp.
Jaeger Watch Co.
J-B-T Instruments
Kopp Scientific
Labline, Inc.
Lumenite Electronic
Marion Electrical Inst.
National Instrument Co.
Paragon Electric Co.
Phillips Petroleum
Potter Instrument
Production Instrument
Rawson Electric Co.
Rhodes, Inc., M. H.
Roller-Smith
Rowe Engineering
Simpson Electric
Standard Elec. Time
Tensitron, Inc.
Thompson Clock Co.
Walkirt Co.
Waltham Watch
Westinghouse Elec.
Weston Elec. Inst. Corp.
Westport Electric

METERS, Ultraviolet Radiation
Beckman Instruments
Bristol Co.
Consolidated Engg. Co.
Farrand Optical
General Elec. Co.
Hanovia Chem. & Mfg.
Nuclear Chicago
Pfaltz & Bauer
Photovolt Corp.
Precision Radiation Insts.
Process & Instruments
Westinghouse Elec.

METERS, Venturi (See Flowmeters, Venturi)

METERS, V-Notch (See Flowmeters, Weir)

METERS, Volumetric, Positive Displacement (See Gas Meters, Positive; See Meters, Liquid, Volumetric)

METERS, Water (See Liquid Meters, Volumetric; also Flowmeters, Liquid)

METERS, Watt-Hour
Associated Research
Duncan Electric
Electron Radar Prod.
Foxboro Co.
GE Apparatus Sales
Landis & Gyr, Inc.
Roller-Smith
Sangamo Electric Co.
Simpson Electric
Sticht Co.
Veeder-Root
Welch Scientific
Westinghouse Elec.

METERS, Weir (See Flowmeters, Weir)

METERS, X-Ray Intensity
Assembly Products
Atomlab, Inc.
Douglas Radio Labs.
El-Tronics, Inc.
General Electric X-Ray
Georator Corp.
Jordan Electronic Mfg. Co.
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MICROMANOMETERS (See Manometers, Micro)

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Scherr Co., Inc.
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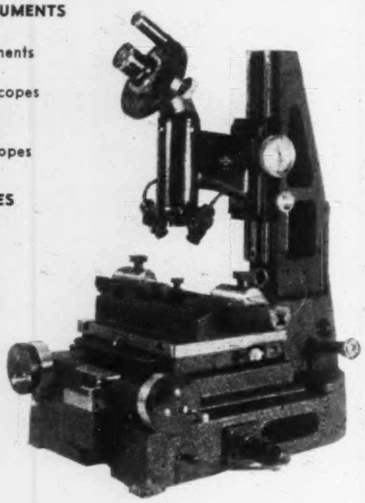

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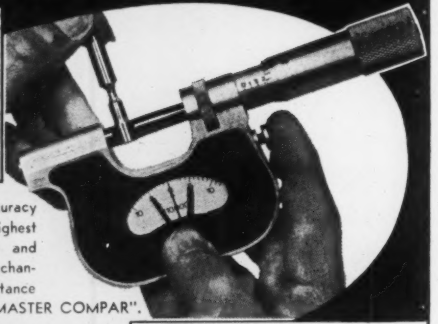

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Wild Heerbrugg Inst.
Zeiss Inc., Carl

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RCA Div.
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Stocker & Yale
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Ferner Co.
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Leitz, Inc.
Los Angeles Scientific Inst.
Michrochemical Service
National Instrument
Opplem Co., Inc.
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Scherr Co., Inc.
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Testa Mfg. Co.
United Scientific Co.
Wild Heerbrugg Inst.
Zeiss, Inc., Carl

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Edmund Scientific Corp
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Ferner Co.
Fish Schurman Corp.
Gaertner Scientific Corp.
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Graf-Apsco Co.
Hacker & Co., W. J.
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Leitz, Inc.
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Scherr Optical Tools
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Welch Scientific
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Edmund Scientific Corp.
Hausser & Son
Jones Optical Works
Penn Optical & Inst.
Testa Mfg. Co.
Thermal Syndicate, Ltd.
United Scientific Co.
Welch Scientific

MICROSCOPES, Ballistic Comparison
American Optical Co.
Bausch & Lomb Optical
Brinkmann Instruments
Ercona Corp.
Ferner Co.
Graf-Apsco Co.
Helio Instrument
International Dev. Co.
Jarrell-Ash Co.
Lafayette Instrument
Leitz, Inc.
Penn Optical & Inst.
Scherr Optical Tools
Zeiss, Inc.

MICROSCOPES, Binocular
American Optical
Bausch & Lomb Optical
Boehmke Optical Co.
Brinkmann Instruments
Bushnell Optical
Central Scientific
Edmund Scientific Corp.
Ercona Corp.
Fecker, Inc., J. W.
Federal Mfg. & Eng.
Ferner Co.
General Biological
Gordon Enterprises
Graf-Apsco Co.
Hacker & Co., W. J.
Helio Instrument
International Dev. Co.
International Micro
Jarrell-Ash Co.
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Los Angeles Scientific Inst.
Opplem Co., Inc.
Polarizing Instrument
Portman Inst.
Scherr Optical Tools
Testa Mfg. Co.
Testing Machines, Inc.
United Scientific Co.
Wild Heerbrugg Insts.
Zeiss, Inc., Carl

MICROSCOPES, Biological (See Microscopes, Binocular)

MICROSCOPES, Brinell
Bausch & Lomb Optical
Detroit Testing Mach.
DoAll Co.
Ercona Corp.
Ferner Co.
Fisher Scientific Co.
Gaertner Scientific Corp.
Gordon Co.
Graf-Apsco Co.
Hacker & Co. J. W.
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Jarrell-Ash Co.
King, Andrew
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Opplem Co.
Pacific Transducer Corp.
Pittsburgh Inst. & Mach.
Riehle Division
Scherr Optical Tools
Steel City Testing Mach.
Testing Machines, Inc.

MICROSCOPES, Dark Field
Aloe Co., A. S.
American Optical
Bausch & Lomb Optical
Brinkmann Instruments
Bushnell Optical
Central Scientific
Ercona Corp.
Ferner Co.
Hacker & Co., W. J.
International Micro
Jarrell-Ash
Leitz Inc.
Opplem Co.
Polarizing Instrument
United Scientific
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Zeiss, Inc., Carl

MICROSCOPES, Electron
Ercona Corp.
Farrand Optical
General Electric X-Ray
North American Philips
Opplem Co.
RCA Div.
Scientific Specialties
Zeiss, Inc., Carl

MICROSCOPES, Finish Comparison
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Bausch & Lomb Optical
Compar Instruments
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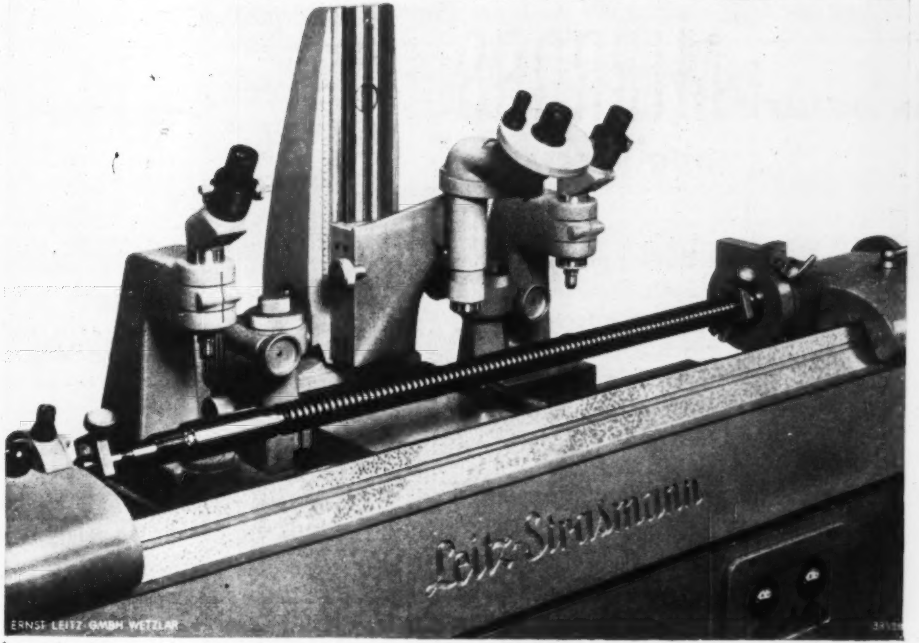

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Stebar Co.
Stocker & Yale
Testa Mfg. Co.
United Scientific
Wilder, R. S.
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Williams, Brown & Earle
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Brinkmann Instruments
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Central Scientific
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Gordon Co., Claud S.
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Opplem Co., Inc.
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Hacker & Co., W. J.
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Los Angeles Scientific Inst.
Opplem Co.
Polarizing Instrument
United Scientific
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MICROSCOPES, Thread Contour (See Microscopes, Finish Comparison)

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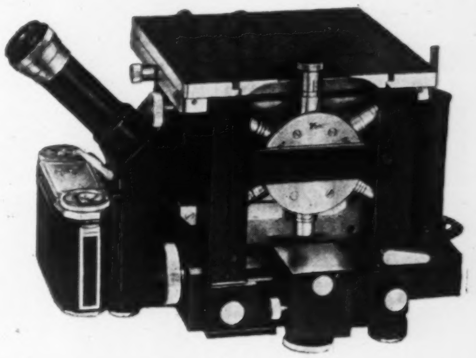

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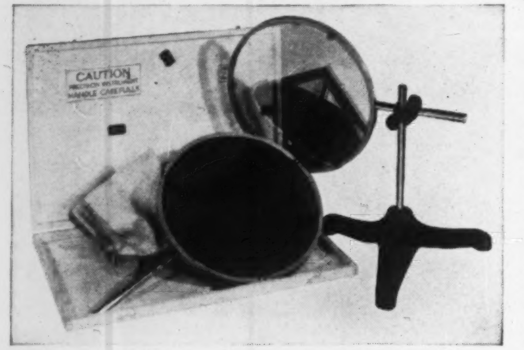

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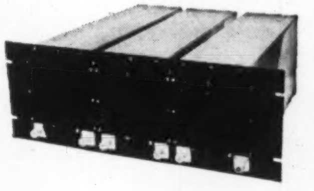
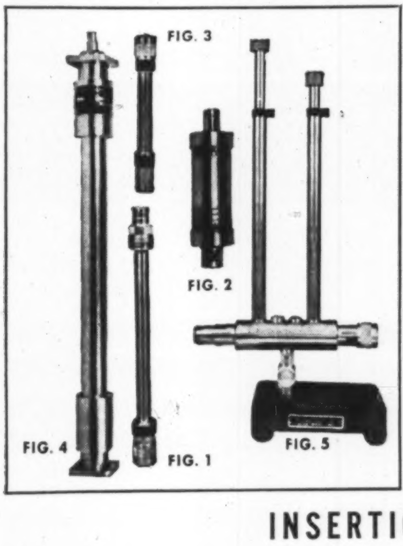
STEP ATTENUATORS



PRECISION STEP ATTENUATOR MODEL #64. The only step attenuator containing low V.S.W.R., 0.1 db steps. Three drums cover the range of 0-64 db in steps of 0.1 db from DC to 1,000 MC. Long life switches and exceptional stability are among the reasons this instrument is used by standard laboratories who cannot afford to make mistakes. Impedance is 50 ohms, connectors type "N"; power capacity 100 mw. CW Calibration chart showing insertion loss, and V.S.W.R. at DC and 1,000 MC supplied. Change of insertion loss of all pads between 0 and 10 db does not exceed .1 db between DC and 1,000 MC, and 0.1 db per 10 db at 1,000 MC for pads between 20 and 50 db. Accuracy of pads at DC is better than .05 db to 10 db, and 0.1 db to 50 db. Ask for Bulletin #37.

COAXIAL ATTENUATOR PADS



Design and Manufacture of Coaxial Pads to Specific Requirements Is Our Specialty.

Not shown is our Model 50 attenuator pad. It has small attenuation errors from DC to 1,000 MC, and is available in steps of 1 db in range 1-10 db and 10 db steps in the 10-40 db range. Accuracy at DC is .05 db from 1 to 10 db, and .1 db between 20 and 40 db. Frequency sensitivity not greater than .2 db from DC to 1 KMC, except for the 30 and 40 db pads which have .3 and .4 db. Will handle average powers of 1 watt with proper termination, and 1 KW peak. Ask for Bulletin #44.

Fig. 1: Type 210 Pad, "lossy line" construction, 50 ohm impedance, with type "N" connectors. Frequency range 1 KMC to 10 KMC; loss range 3, 6, 10, 12, 20 db. Average power varies from 5 to 1 watt, peak power from 10 to 2 KW. Also available with type "C" connectors. Ask for Bulletin #17.

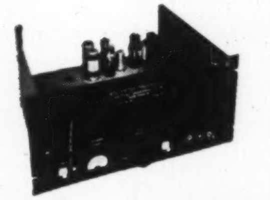
Fig. 2: Precision Power Pads, 50 ohms impedance, type "N" connectors, ±.1 db accuracy from DC to 1,000 KMC. Model 10, 10 watt power pad, "T" type, range 1-3 db, bilateral with male and female connectors. Model 11, range 4-10 db, is unilateral with female input and male ouptut.Model 12, same range as model 11, is also unilateral with male input, and female output. Maximum input V.S.W.R. 1.10. Ask for Bulletin #27.

Fig. 3: "S" Band attenuators, 50 ohms impedance, type "N" connectors, CN 42, CN 43, CN 29, provide insertion losses of 10, 16, and 20 db. Our commercial versions cover the range 1-20 db in models, 301, 303, 306, etc. (1 db, 3 db, 6 db, etc.). Also similar are types 410, and 416 having an OD less than ¾" for use with TS-125 power meter, Ask for Bulletin #43.

Fig. 4: ⅞" Rigid Line Pad, types CN 168, CN 169, CN 110, provides losses of 3, 6, and 10 db. Frequency range is 1 KMC to 4 KMC. Max. average power input is between 10 and 5 watts, peak power input is between 20 and 10 KW. Also available for ⅞" rigid line are type 46 pads with frequency range from DC to 1 KMC and insertion losses of 3, 6, 10, and 20 db. Ask for Bulletin #42.

Fig. 5: Double Stub Tuner; Model DS 109 covers 750 MC to 10 KMC, and model DS 109L covers 400 MC to 4 KMC. Stub tap positions are adjustable facilitating ease of adjustment for impedance matching. The specially designed shorts carry low current through the sliding contacts giving exceptionally smooth adjustment. Ask for Bulletin #19.

INSERTION LOSS TEST SETS, PARTS FOR:



BOLOMETER PREAMPLIFIER MODEL BA-1: Measures insertion loss between 0 and 30 db at low R. F. power levels in conjunction with recommended bolometer and VTVM. Bolometer burnout from other than R-F overload is practically impossible. Bolometer can be inserted and removed without disconnecting DC. Combined with low noise level are freedom from hum pickup, and wide dynamic linear range of 60 db with linearity better than 0.1 db. Frequency is 1 KC with band-width of 35 cps. Adjustable gain, 10,000 maximum. Equivalent input noise from 200 ohm source less than 30 x 10^{-9} volts RMS. Input impedance above 2,000 ohms for operation from 200 ohm Bolometer. 30 volts max. linear output into 1 megohm. Ask for Bulletin #23.

CATHODE FOLLOWER MODEL CF-1: Input impedance matches output of BA-1 Bolometer Preamplifier. Utilizes a 2,000 ohm precision attenuator with an accuracy of .01 db at 1 KC; eliminates errors in insertion loss measurements caused by accuracy limitations of VTVM. For further details ask for Bulletin #38.

MODULATED OSCILLATOR MODELS MS-1, MS-2, MS-3, R. F. sources for insertion loss measurement, cover the frequency ranges 50-250 MC, 250-920 MC, and 900-2,000 MC with 1 KC ± 5cps. square wave modulation (100%). Minimum peak output is 100 MW into 50 ohms with excellent long-time amplitude stability. Ask for Bulletin #40.

OTHER PRODUCTS

KEYBOARD OSCILLATOR MODEL 150: Used extensively for checking filters where it is necessary to explore small portions of the curve in detail. Covers range from 1 to 100,000 cycles with rapid, accurately repeated, frequency selection. Drift less than 0.02% per hour. Steps of .1 cps. to 1 KC, 1 cps. to 10 KC, continuous tuning to 10-100 KC. Full details in Bulletin #41.

POWER PULSE GENERATOR MODEL PG-1, for the generation of high power pulses for testing of components by video pulses. Output: maximum of 1,500 volts into 50 ohms, with pulse lengths of 1 to 5 microseconds, variable in 1 microsecond steps, and PRF of 20 to 2,000 cps limited by the capacity of the power supply. Ask for Bulletin #39.

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CALIBRATION SERVICE: Our insertion loss calibration service for coaxial equipment, is available to certify up to 50 db from 50 MC through 10,000 MC. Two accuracies of measurement are available: A): .01 db per 5 db. B). .05 db per 5 db.

NOTE: Class "A" calibrations are usually not justified for coaxial equipment above 1,000 MC, due to inaccuracy of impedance measurements in coaxial devices.

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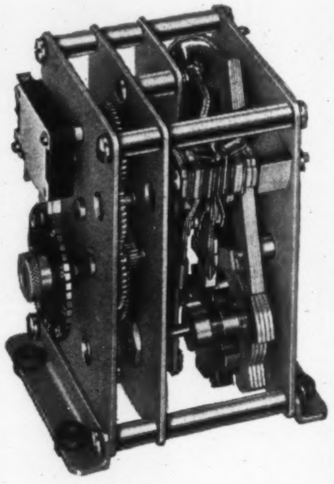

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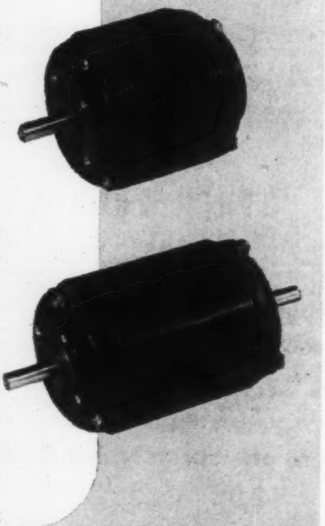

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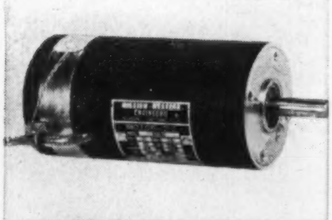
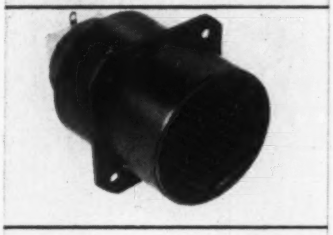
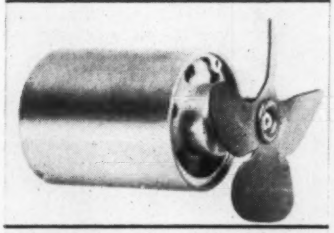
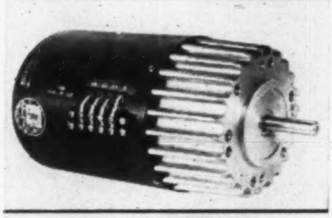
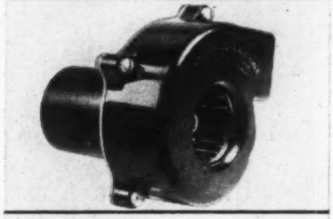
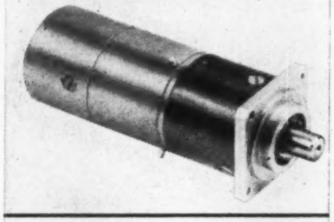
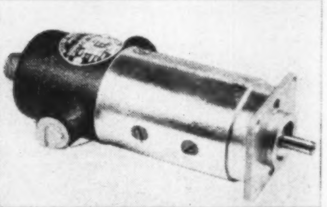
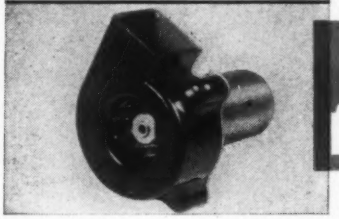

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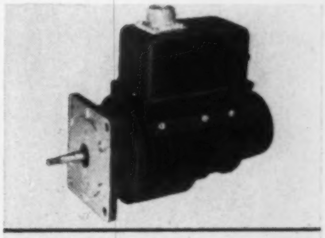
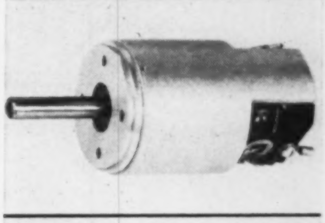
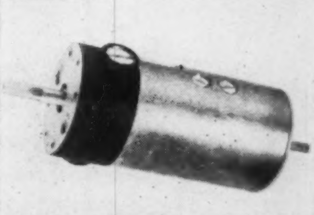
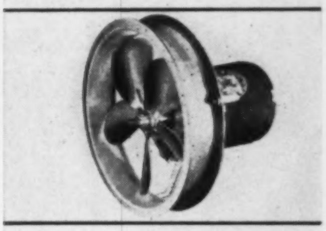
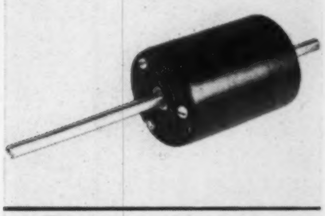
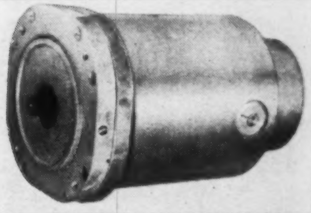
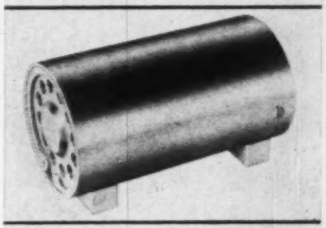
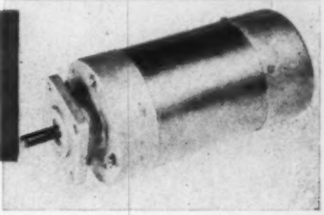

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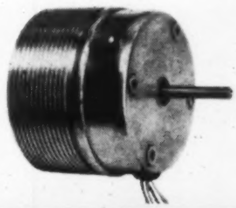

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Transmitter	CG-8-AS-1	26 Volts 400 c.p.s.	11.8 Volts	15′	Transmitter for control circuits; not recommended for torque transmission
Control Transformer	CT-8-AS-1	11.8 Volts 400 c.p.s.	23 Volts	15′	3 or 4 will operate satisfactorily from CG-8-AS-1 transmitter
Resolver	CS-8-AS-1	11.8 Volts 400 c.p.s.	21 Volts	15′	
Control Differential	CD-8-AS-1	11.8 Volts 400 c.p.s	10.2 Volts	15′ Stator 15′ Rotor	

SIZE 10

Weight 50 grams

Function	Type Number	Excitation Voltage & Frequency	Output Voltage	Guaranteed Accuracy Spread	Remarks
Transmitter	CG-10-AS-1	26 Volts 400 c.p.s.	11.8 Volts	12′	High Power Transmitter; MIL-T-5350A; Multiple C.T. and Receiver Applications
Transmitter	CG-10-AS-7	26 Volts 400 c.p.s.	11.8 Volts	12′	For C.T. Operation
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Control Transformer	CT-10-AS-1	11.8 Volts 400 c.p.s.	23.0 Volts	15′	
Control Transformer	CT-10-AS-4	11.8 Volts 400 c.p.s.	23.0 Volts	15′	High Impedance
Control Transformer	CT-10-AS-7	11.8 Volts 400 c.p.s.	46.0 Volts	15′	High Sensitivity (Double Rotor Output)
Control Differential	CD-10-AS-1	11.8 Volts 400 c.p.s.	10.8 Volts	15′ Stator 10′ Rotor	
Resolver	CS-10-AS-1	11.8 Volts 400 c.p.s.	21 Volts	15′	2 Phase Rotor, 2 Phase Stator
Resolver	CW-10-AS-1	11.8 Volts 400 c.p.s.	21 Volts	15′	1 Phase Rotor, 2 Phase Stator
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SIZE 11

Weight 82 grams

Function	Type Number	Excitation Voltage & Frequency	Output Voltage	Guaranteed Accuracy Spread	Remarks
Transmitter	CG-11-B-2	26 Volts 400 c.p.s.	11.8 Volts	12′	High Power Transmitter; MIL-T-5350A; Multiple C.T and Receiver Applications
Transmitter	CG-11-B-7	26 Volts 400 c.p.s.	11.8 Volts	12′	For C.T. Operation
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Receiver	CR-11-B-2	26 Volts 400 c.p.s.	11.8 Volts	30′	Torque 3,300 mg-mm/degree with CG-11-B-2 Transmitter; MIL-I-7057
Control Transformer	CT-11-B-2	11.8 Volts 400 c.p.s.	23 Volts	12′	
Control Transformer	CT-11-E-7	11.8 Volts 400 c.p.s.	23 Volts	12′	High Impedance
Control Transformer	CT-11-D-6	11.8 Volts 400 c.p.s.	57 Volts	12′	High Sensitivity (1 volt/degree)
Control Transformer	CT-11-B-8	11.8 Volts 400 c.p.s.	22 Volts	12′	
Control Differential	CD-11-B-2	11.8 Volts 400 c.p.s.	10.9 Volts	10′ Rotor 12′ Stator	
Resolver	CS-11-B-2	12.6 Volts 400 c.p.s.	22.6 Volts	12′	
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SIZE 15

Weight 126 grams

Function	Type Number	Excitation Voltage & Frequency	Output Voltage	Guaranteed Accuracy Spread	Remarks
Transmitter	CG-15-A-1	26 Volts 400 c.p.s.	11.8 Volts	10′	High Power Transmitter; MIL-T-5350A; Multiple C.T. and Receiver Applications
Transmitter	CG-15-A-4	26 Volts 400 c.p.s.	11.8 Volts	10′	For C.T. Operation
Receiver	CR-15-A-1	26 Volts 400 c.p.s.	11.8 Volts	30′	Torque 3,300 mg-mm/degree with CG-15-A-4 Transmitter; MIL-I-7057
Control Transformer	CT-15-A-1	11.8 Volts 400 c.p.s.	22 Volts	10′	
Control Transformer	CT-15-A-4	11.8 Volts 400 c.p.s.	22 Volts	10′	High Impedance
Control Transformer	CT-15-A-7	11.8 Volts 400 c.p.s.	57 Volts	10′	High Sensitivity (1 volt/degree)
Control Differential	CD-15-A-1	11.8 Volts 400 c.p.s.	10.8 Volts	10′ Rotor 10′ Stator	
Resolver	CS-15-A-1	11.8 Volts 400 c.p.s.	22 Volts	10′	
Resolver	CS-15-A-4	11.8 Volts 400 c.p.s.	22 Volts	10′	High Impedance
Resolver	CW-15-A-1	15 Volts 400 c.p.s.	28 Volts	10′	Very High Impedance
Transmitter	CG-15-MS-1	115 Volts 400 c.p.s.	90 Volts	10′	MIL-S-16892; Gov't. Designation 15CX4a Weight 174 grams

SIZE 22

Weight 528 grams

Transmitter	CG-22-A-1	26.0 Volts 400 c.p.s.	11.8 Volts	10′	Available for 60 c.p.s. use on Special Order.

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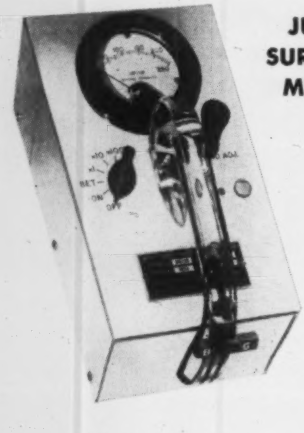

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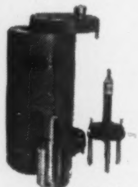

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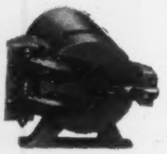

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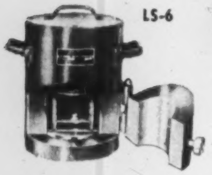

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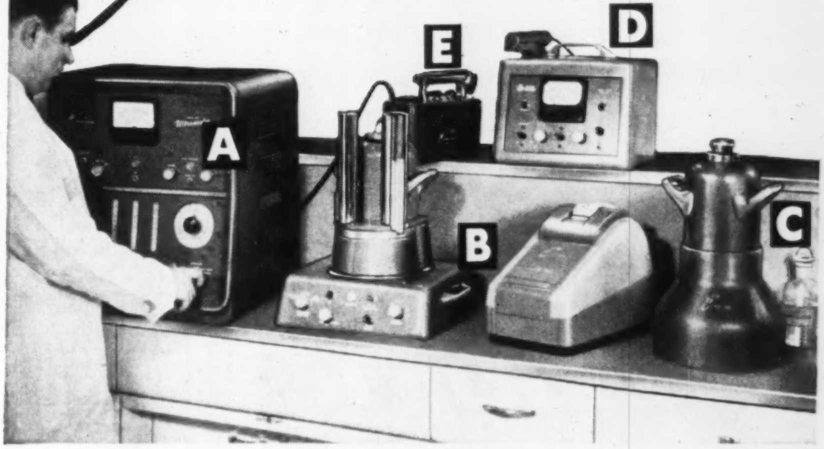

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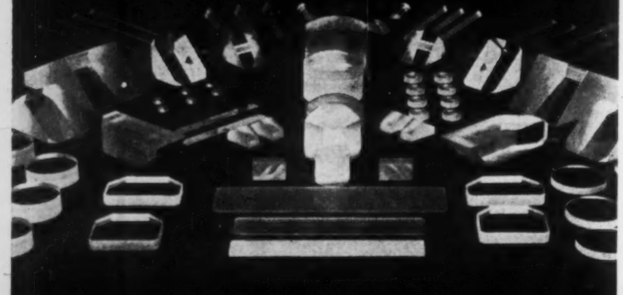

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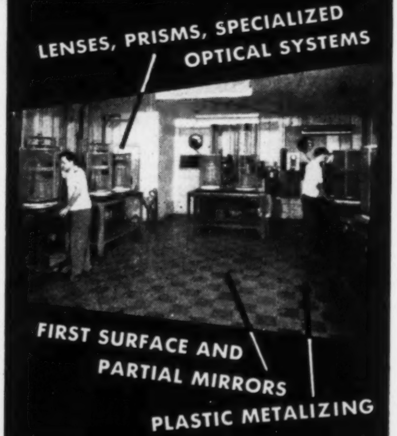

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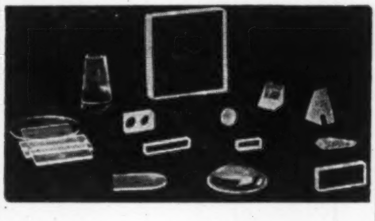

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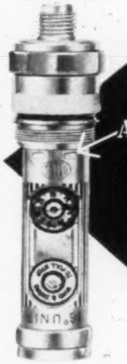

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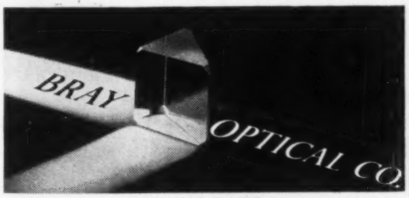

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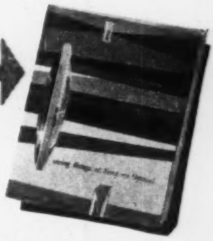

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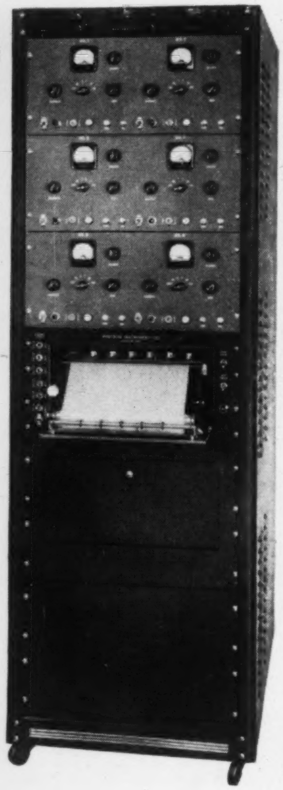

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Jackson Elec. Inst.
Kahn & Co.
Kaye Development
Kinetic Instrument
Krohn-Hite Inst.
Leeds & Northrup Co.
Lewyt Metal Prod.
Madison Elec. Prod.
Marconi Instruments
Measurements Corp.
Millen Mfg. Co.
Neucor, Inc.
Pacific Div.
Phillips Petroleum
Polarad Electronics
Precise Development
Precision Apparatus
Probescope Co.
Radex Corp.
Radio City Products
Rahm Instruments
Raytheon Mfg. Co.
RCA Div.
Reiner Electronics
Riverbank Labs.
Scott, Inc., Hermon H.
Servo Corp. of America
Shasta Div.
Sherron Metallic
Sylvania Elec. Prod.
Southwestern Ind. Elec.
Teletronics Lab.
Televiso Co.
Thordarson-Meissner
Trimount Inst. Co.
Triplett Electrical Inst.
Triumph Mfg. Co.
Ultrasonic Engr. Co.
Vari-L Co.
Varo Mfg.
Vectron, Inc.
Virginia Electronics
Walkirt
Waterman Products
Waveforms, Inc.
Wiancko Engineering

OSCILLATORS, Microwave

Airborne Inst.
Amerac, Inc.
Amer. Electroneering
Avion Div.
C.G.S. Labs.
Daystrom Inst.
F. R. Machine Works
General Electric Co.
Hewlett-Packard
Hycon
Jackson Co., Byron
Kahn & Co
Kearfott Co.
Lavoie Labs.
Marconi Instruments
Maxson Instruments
Maxson Corp., W. L.
Microwave Assocs.
New London Inst. Co.
Polarad Electronics
Polytechnic Res. & Dev.
Raytheon Mfg. Co.
RCA Div.
Rollins Co.
Servo Corp. of America
Sierra Electronic
Sperry Gyroscope Co.
Thordarson-Meissner
Varian Associates
Vectron, Inc.

OSCILLATORS, Radio-frequency

Aerovox Corp.
Airborne Inst. Laboratory
Amerac, Inc.
Amer. Electroneering
Audio-Tone Oscillator
Authorized Mfrs. Service
Avion Div.
Bliley Electric Co.
Boonton Radio Corp.
Bradshaw Instruments
Bunnell & Co. J. H.
Canoga Corp.
Clarke Inst. Corp.
Clippard Corp.
Clough-Brengle Co.
Collins Radio Co.
Crystal Research
Daystrom Inst.
Devtronics, Inc.
Diatron, Co.
Donner Scientific
Electro-Medical Lab.
Electronic Dev. Lab.
Electronic Instrument
Electronic Meas. Corp.
Electronic Mfg. Co.
El-Tronics, Inc.
Engineering Res. & Dev.
Federal Telephone
Feiler Engineering
Ferris Inst. Corp.
Freed Transformer
G.E. Electronics Div.
General Electronic
General Radio Co.
Georator Corp.
Harvey Radio Labs.
Hewlett-Packard
Hickok Elec. Inst. Co.
Hycon Mfg. Co.
International Std. Trading
Islip Radio Mfg.
Jackson Co., Byron
Jackson Electrical Inst.
Jersey City Tech. Lab.
Kahn & Co.
Kay Electric
Lavoie Laboratories
Lear, Inc.
Lewyt Metal Prod.
Lyman Electronics
Manson Labs.
Marconi Instruments
McFarlin Co.
Measurements Corp.
Millen Mfg. Co.
Mohawk Electronic
New London Inst. Co.
Pacific Div.
Polarad Electronics
Polytechnic Res. & Dev.
Precise Development
Precision Apparatus
Premier Research Labs.
Rahm Instruments
Raytheon Mfg. Co.
RCA Tube
Rollin Co.
Servo Corp. of America
Shasta Div.
Sherron Metallic
Sierra Electronic
Simpson Elec. Co.
Sperry Gyroscope
Standard Piezo Co.
Sylvania Elec. Prod.
Technology Instrument
Telechrome, Inc.
Teletronics Lab.
Televisco Co.
Telonic Industries
Thordarson-Meissner
Triplett Electrical Inst.
Triumph Mfg. Co.
Ultrasonic Engr. Co.
Varian Associates
Vari-L Co.
Vectron, Inc.
Walkirt Co.
Waterman Products
Waveforms, Inc.
Weston Elec. Inst. Corp.
Wilmar Mfg. Co.

OSCILLATORS, Ultrasonic

American Electronic Labs.
Atlantic Research
Brush Electronics
Corbett Science Labs.
Devtronics, Inc.
Diatron Co.
Donner Scientific
Electronic Instrument
Engineering Res. & Dev.
General Electric
Gen. Precision Lab.
General Radio
Hewlett-Packard
Hycon Mfg. Co.
Kay Electric
Krohn-Hite, Inst.
Measurements Corp.
Neucor, Inc.
Photocon Research
Raytheon Mfg.
Reed Research
Scott Inc., Hermon H.
Southwestern Ind. Elec.
Sperry Products
Teletronics Lab.
Thordarson-Meissner
Ultrasonic Engr. Co.
Virginia Electronics
Waveforms, Ind.

OSCILLOGRAPHS, Automatic

Beva Laboratory
Brush Electronics
Century Geophysical
Consolidated Engg.
Du Mont Labs.
Electro-Tech Equip. Co.
Feiler Engineering
General Electronic
GE Apparatus Sales
Geotechnical Corp.
Hamilton Watch
Hathaway Instruments
Heiland Div.
Hycon Mfg. Co.
Midwestern Instruments
Miller Corp. Wm.
Sherron Metallic
Triumph Mfg. Co.
United Cinephone Corp.
Waterman Products Co.
Westinghouse Elec.

OSCILLOGRAPHS, Cathode ray

American Lens Co.
Beam Instrument
Bellco Glass, Inc.
Beva Laboratory
Bradshaw Instruments
Browning Labs.
Cambridge Inst. Co.
Cardwell Mfg. Co.
CBS-Hytron
Central Research Labs.
Central Scientific
Clippard Inst. Co.
Clough-Brengle Co.
Commercial Research
Dayton Acme Co.
DuMont Labs., Inc., A. B.
Eitel McCullough
Electro-Medical Lab.
Electro Products Lab.
Electronic Dev. Lab.
Electronic Instrument
Electronic Meas. Corp.
Electronic Tube
Engineering Res. & Dev.
Federal Telephone
Feiler Engineering
Fredericks, George
Furst Electronics
GE Apparatus Sales
General Elec. X-Ray Corp.
General Electronic
General Radio Co.
Hamilton Watch
Hathaway Inst. Co.
Heiland Div.
Hickok Elec. Inst. Co.
Hycon Mfg. Co.
I-L-S Instrument
Industrial Electronics
Jackson Electrical Inst.
Lavoie Labs.
Millen Mfg. Co.
Miller Corp., Wm.
North Amer. Philips
Physics Research
Precision Apparatus
Process & Instruments
Rauland Corp. (Tubes)
Raytheon Mfg. Co.
RCA Tube
Scientific Specialties
Simpson Electric Co.
Southwestern Ind. Elec.
Supreme Inc.
Standard Arcturus
Sylvania Elec. Prod.
Tektronix, Inc.
Thordarson-Meissner
Triplett Electrical Inst.
Triumph Mfg. Co.
United Transformer Corp.
Volkers & Schaffer
Walker-Jamieson, Corp.
Waterman Prod. Co.
Wyland (Tubes)

OSCILLOGRAPHS, Moving-conductor

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Century Geophysical
Corbett Science Labs.
Edin Electronics
General Electric
Georator Corp.
Hamilton Watch
Hathaway Instruments
Heiland Div.
Opplem Co.
Sanborn Co.
Waterman Products Co.
Westinghouse Elec.

OSCILLOGRAPHS, Multi-element

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Baldwin-Lima-Hamilton
Beam Instrument
Brush Electronics
Cambridge Inst. Co.
Century Geophysical
Coleman Instrument
Consolidated Engg.
Corbett Science Labs.
Edin Electronics
Electro-Medical Lab.
Electro-Tech Equip.
Engineering Labs., Inc.
Epic, Inc.
Feiler Engineering
GE Apparatus Sales
Genisco, Inc.
Georator Corp.
Geotechnical Corp.
Gilman Scientific Insts.
Hamilton Watch
Hathaway Instruments
Heiland Div.
Midwestern Instruments
Miller Instruments
Opplem Co.
Sanborn Co.
Southwestern Ind. Elec.
Technical Insts., Inc.
Techno Inst. Co.
Texas Instruments
Waterman Products Co.
Westinghouse Elec.

OSILLOGRAPHS, Piezo-electric

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Cambridge Inst. Co.
Corbett Science Labs.
Electro-Medical Lab.
Engineering Labs.
Georator Corp.
McFarlin Co.
Waterman Products Co.

OSCILLOGRAPHS, Recording

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Central Research Labs.
Century Geophysical
Coleman Instrument
Consolidated Engg.
Corbett Science Labs.
Du Mont Labs.
Edin Co., Inc.
Electro-Medical Labs.
Electro-Products Lab.
Engineering Labs., Inc.
Epic, Inc.
GE Apparatus Sls.
General Radio Co.
Genisco, Inc.
Geotechnical Corp.
Gilman Scientific Inst.
Grass Instrument
Hamilton Watch
Hathaway Inst. Co.
Heiland Div.
Hycon Mfg. Co.
Martin-Hubbard Corp.
Mid-Century Instrumatic
Midwestern Instruments
Miller Instruments
Offner Electronics
Opplem Co.
Photron Instrument
Rahm Instruments
Reed Research
Sanborn Co.
Sound Apparatus Co.
Southwestern Ind. Elec.
Technical Insts. Inc.
Technology Instrument
Texas Instruments
Triumph Mfg. Co.
Victor Lab., J. N.
Waterman Products Co.
Westinghouse Elec.
Wollensak Optical

OSCILLOSCOPES

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Beam Instrument
Beva Laboratory
Browning Labs.
Brush Electronics
Central Scientific Co.
Clippard Inst. Lab.
Clough-Brengle Co.
Commercial Research
Computer Co. of America
DuMont Labs. Inc. A.B.
Electronic Dev. Lab.
Electronic Instrument
Electronic Measurements
Electronic Tube
Electronics Div., G.E.
El-Tronics, Inc.
Federal Telephone
Feiler Engineering
Furst Electronics
General Elec. Co.
General Electronic
General Radio Co.
Harvey Radio Labs.
Hickok Elect. Inst.
Hycon Mfg.
I-L-S Instrument
Jackson Electrical Inst.
Lavoie Labs.
Miller Instruments
Millen Mfg. Co.
National Co.
Philco Corp.
Polarad Electronics
Precise Development
Precision Apparatus
Probescope Co.
Radio City Products
RCA Tube
Reiner Electronics
Sherron Metallic
Simpson Electric
Southwestern Ind. Elec.
Spencer-Kennedy
Supreme Inc.
Sylvan Electronic Labs.
Sylvania Elec. Prod.
T.L.G. Electric
Techno Inst. Co.
Tektronix, Inc.
Telechrome, Inc.
Television Equipment
Thordarson-Meissner
Trad Television
Triplett Elec. Inst.
Triumph Mfg. Co.
Ultrasonic Engr.
Volkers & Schaffer
Waterman Prod. Co.

OUTPUT METERS

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Ballatine Labs.
Brush Electronics
Chicago Indust. Inst.
Clippard Inst. Lab.
Clough-Brengle Co.
Columbus Products Corp.
Computer Co. of America
Dale Instruments
Daven Co.
Electronic Development
Electronic Instrument
Electronic Measurements
Electro Products Lab.
Electro-Tech Equip.
Feiler Engineering
General Elec. Co.
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General Radio Co.
Hewlett-Packard
Hickok Elec. Inst.
Jackson Electrical Inst.
Marion Electrical Meters
M B Mfg. Co.
Meters Inc.
Pace Electrical Inst.
Precision Apparatus
Radio City Products
RCA Div.
Reiner Electronics
Sensitive Research Inst.
Shallcross Mfg. Co.
Simpson Electric Co.
Thordarson-Meissner
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

OVENS, Controlled Atmosphere

American Instrument
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Chicago Surgical & Elec.
Distillation Products
DoAll Co.
Electric Hotpack
Gordon Co., Claud S.
International Radiant
Kirk & Blum Mfg.
Labline, Inc.
Laboratory Equip. Corp.
McCoy Electronics
Pacific Scientific
Precision Scientific
Rockwell Co., W. S.
Sodemann Heat
Surface Combustion
Tenney Engineering

OVENS, Crystal Oscillator

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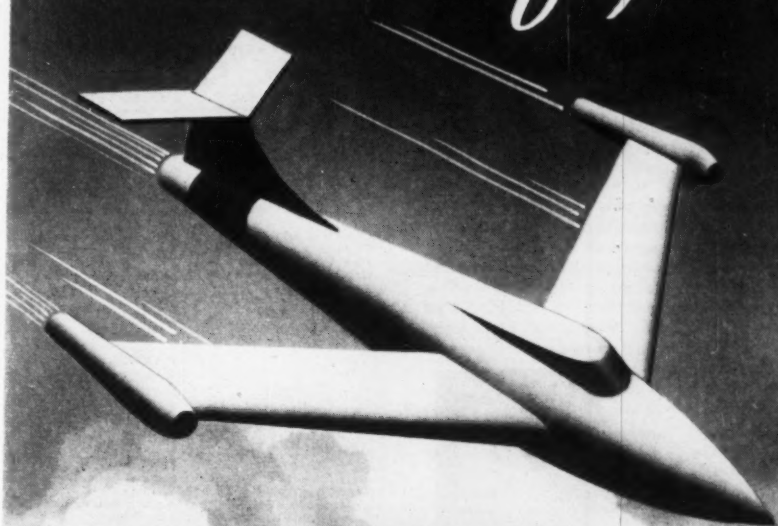
Bliley Electric
Blue M. Electric
Electric Hotpack Co.
Enwood, Inc
Federal Telephone
L & O Research
Lavoie Labs
McCoy Electronics
Premier Research
RCA Div.
Standard Piezo
Telectronics Lab.

OVENS, Laboratory

Ace Glass Co.
Aloe Co., A. S.
American Inst. Co.
American Research Corp.
Blue M. Electric Co.
Boekel & Co.
Brabender Corp.
Braun Corp.
Burrell Corp.
Bush Associates, G.F.
Central Scientific Co.
Chicago Surgical & Elec.
Dietert Co.
Electric Heat Control
Electric Hotpack
Falstrom Co.
Federal Telephone Co.
Ferner Co.
Fisher Scientific Co.
General Biological
Gordon Co., Claud S.
Grieve-Hendry Co.
Humboldt Mfg. Co.
Huppert Co.
K. & H. Industrial Prods.
Kearfott Co.
Kirk & Blum Mfg.
Labline, Inc.
Laboratory Equipment
Lindberg Air
Link Aviation
Lucifer Electric
Martin & Co.
Metalab Equipment
Modern Elec. Lab.
National Appliance
Pacific Scientific

STABILITY *in flight*



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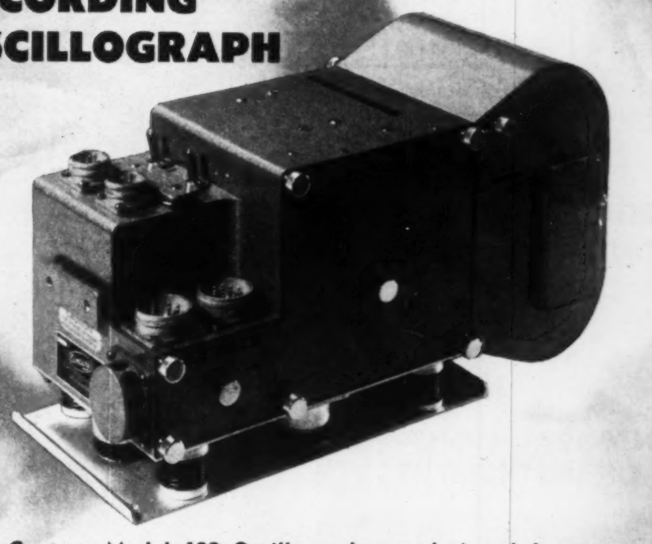
By Century Model 409
RECORDING
OSCILLOGRAPH



The Century Model 409 Oscillograph was designed for operation under the most adverse conditions, especially where space and weight considerations are limited. It is a miniature, compact unit incorporating many features found in larger models. Records faithfully during accelerations and shock in excess of 20 G's. Its size and capacity make it especially desirable for use in missile launching, parachute seat ejection, flight test of helicopter and fighter aircraft and torpedo studies.

Century GEOPHYSICAL CORPORATION
TULSA, OKLAHOMA

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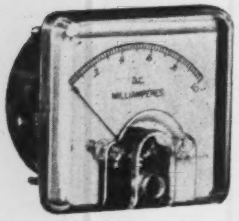
238 Lafayette St. Dayton 2, Ohio
504 Interurban Bldg. Dallas, Texas
EXPORT OFFICE 149 Broadway, N. Y. City

For more information circle **237** on inquiry card.

Panel Meters

Bulletin G-9



Model 261 shown, Price $11.50

White-face, Black-face, or Colored Dials. Can be calibrated in any units: (Amps, KV, FPM, Angstrom Units)

Large dial area—clearly visible. Less waste panel space. Easily lighted—translucent dials for rear-of-panel lighting on quantity orders. Transparent front and case. Normally styrene—other plastics available for quantity orders. Anti-static treated. Tubing pointer normally supplied. Knife-edge and other types available on quantity orders. D'Arsonval movement in Alnico permanent magnet. Snap-fit construction, virtually dust-tight case. A.C. meters are rectifier type. Model 451 is $4\frac{1}{2}$" x $3\frac{25}{32}$"; Model 351 is $3\frac{3}{4}$" x $3\frac{3}{8}$"; Model 261 is $2\frac{21}{32}$" x $2\frac{15}{32}$". Meters with Zero Right, Zero Center or up to two-thirds of range suppressed can be supplied.

D.C.
MICROAMPERES

A.C. and D.C. meters can be furnished in multiple ranges. Meter ranges from 0-20 Ua and 0-5 Mv up.

Panel meters with black Bakelite cases also available. Model 301 shown.

New: ruggedized-sealed panel meters ($2\frac{1}{2}$", $3\frac{1}{2}$", and $4\frac{1}{2}$" dia.).

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Soiltest, Inc.
Standard Science Sup.
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OXYGEN & NITROGEN TESTING APPARATUS (See Gas Analyzers, Oxygen & Nitrogen Apparatus)

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Eclipse-Pioneer Div.
Gadgets Inc.
Grove Valve & Regulator
Mine Safety Appliances
Mira Scientific

OXYGEN REGULATORS Aircraft

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Bendix Aviation
Black Mfg. Co.
Eclipse-Pioneer Div.
Gaertner Scientific
Grove Valve & Regulator
Linde Air Products
Mine Safety App. Co.
Mira Scientific
Nester Co., Inc., L.G.

PAINT changing color with temperature

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Kaye Development
Tempil Corp.
Tenney Engineering

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PANELS, Edge Lighted

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Bailey Meter Co.
Hays Corp.
Spartan Coach & Mfg. Co.
Stafford Co.
U. S. Radium Corp.

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Bailey Meter Co.
Dietz Co.
Falstrom Co.
Fischer & Porter Co.
Foxboro Co.
Industrial Engr'ng Corp.
Leeds & Northrup Co.
Machinery Electrification
Panellit, Inc.
Renick Co., L. C.
Stafford Co.

PANELS, Instrument

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Allied Engraving
American Laubscher
Askania Regulator
Automatic Temp. Control
Baer Co., S. C.
Baltic Metal Prods.
Barber-Colman Co.
Berkeley Scientific
Blue M Electric
Bogue Elec. Mfg. Co.
Bristol Co.
Brooks Inst. Co.
Bud Radio Inc.
Builders-Providence
Cal-Tronics Corp.
Canadian Radium
Clark Cooper
Conoflow Corp.
ConRay Corp.
Continental Electric
Dietz Co., Henry G.
Dittmore & Freimuth
Eastern Specialty Co.
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Electrosig Corp.
Falstrom Co.
Fischer & Porter
Foxboro Co.
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General Electronic
General Tire
Globe Industries Inc.
Gordon Co., C.S.
Hagan Corp.
Hays Corp.
Henschel Corp.
Industrial Engr.
Industrol Corp.
Jones Motrola Corp.
Kahn & Co.
Karl-Douglas Associates
Karp Metal Products
King Engineering
Lake Erie Elec. Mfg.
Littleford Bros.
Mason-Neilan Regulator
Maymer Corp.
Mercoid Corp.
Miller Dial & Nameplate
Minneapolis-Honeywell
Moore Products
Nankervis Co., G. L.
New Hermes, Inc.
Pacific Scientific
Panellit Inc.
Par-Metal Products
Penn Industrial Inst.
Phaostron Co.
Podbielniak, Inc.
Premier Metal Etching
Proportioneers, Inc.
Quaid Fabrications
Radiaphone Co.
Ramapo Engr.
Regent Controls
Renick Co.
Republic Flow Meters
Simpson Electric
Stewart-Warner
Sunshine Scientific
Taller & Cooper
Taylor Inst. Cos.
Topp Industries
Trimount Instrument
Universal Aviation
U. S. Radium Corp.
Virginia Electronics
Weksler Thermometer
West Corp.
Wheelco Div.
Whiddett Co., John C.

PANELS, Radio Test

Allied Engraving
American Electroneering
Authorized Mfrs. Service
Baer Co., S.C.
Bunnell Co., Inc., J.H.
Cal-Tronics Corp.
Computer Co. of America
Electro Devices Inc.
General Electronic
Kahn & Co.
Karp Metal Products
Lear Inc.
Miller Dial & Nameplate
Par-Metal Products
Phaostron Co.
Premier Metal Etching
Radiaphone Co.
Universal Aviation
Virginia Electronics

PANTOGRAPHS

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Gaertner Scientific Corp.
Gordon Enterprises
Green Inst. Co.
Henschel & Co.
Keuffel & Esser Co.
Los Angeles Scien. Inst.
Mico Instrument Co.
New Hermes, Inc.
Newmatic Corp.
Physics Research
Preis Engrv. Mach.
Speidel & Co.
Warren-Knight Co.
Weber Co.

PARTICLE SIZE APPARATUS

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La Pine & Co., A. S.
Mine Safety Appliances
Pa.o Lab. Supplies
Phoenix Precision Inst.

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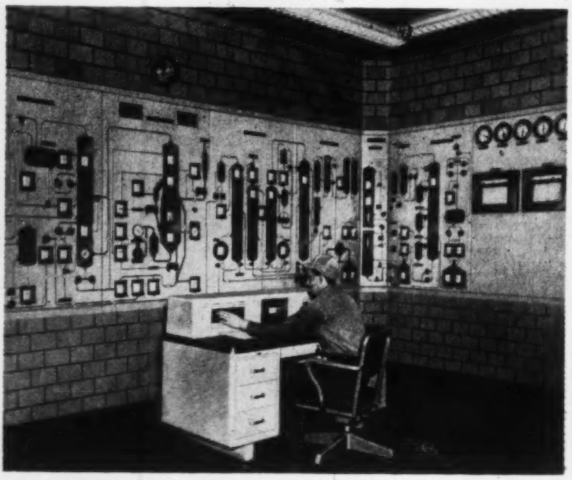

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Weber Co.
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Pioneer Instrument Co.
Precision Therm.
Sperry Gyroscope
Stafford Co.
Thwing-Albert Inst. Co.
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PENETROMETER NEEDLES (See Needles, Penetrometer)

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Ess Inst. Co.
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Helio Instrument
Kollmorgan Optical Co.
Laboratory Optical
Lenox Inst. Co.
Mann Co., W. I.
Penberthy Instrument Co.
Perkin-Elmer Corp.
Testa Mfg Co.
Tinsley Labs.
Unertl Optical Co.

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Bray Optical Co.
Brooke Engr. Co.
Buchele, W.
Davidson Mfg. Co.
Farrand Optical
Fecker, J. W.
Gaertner Scientific
Gordon Enterprises
Helio Instrument
Keuffel & Esser Co.
Kollmorgan Optical Co.
Lenox Inst. Co.
Librascope Inc.
Mann Co., W. I.
Norden-Ketay Corp.
Opplem Co.
Penn Optical & Inst.
Perkin-Elmer
Testa Mfg. Co.
Topp Industries
Unertl Optical Co.
Wild Heerbrugg

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Cambridge Inst. Co.
Fisher Scientific Co.
General Electric
Hathaway Inst. Co.
Leeds & Northrup Co.
Rawson Elec. Inst.
Rese Eng.
Rubicon Co.
Sunshine Scientific
Welch Scientific

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Humboldt Mfg. Co.
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Ruska Inst. Corp.
Sheffield Corp.
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Testing Machines, Inc.
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Kocour Co.
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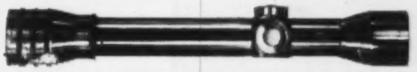

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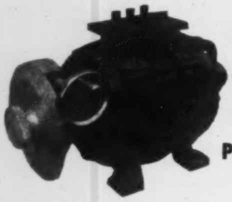

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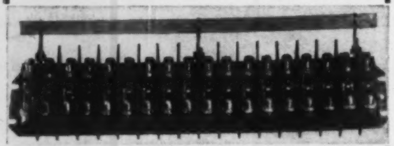

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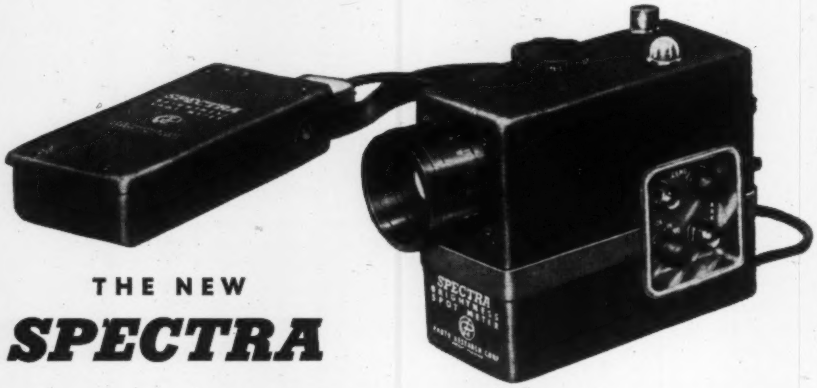

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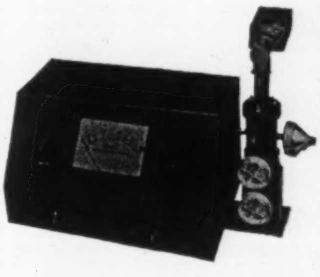

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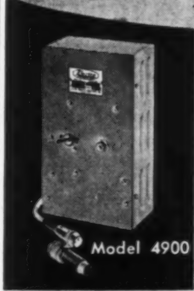

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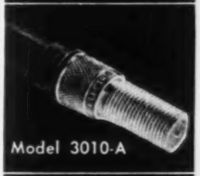

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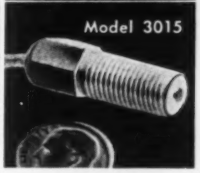

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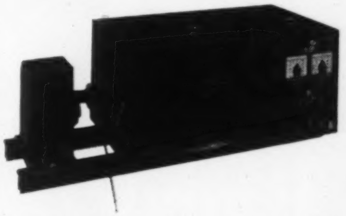

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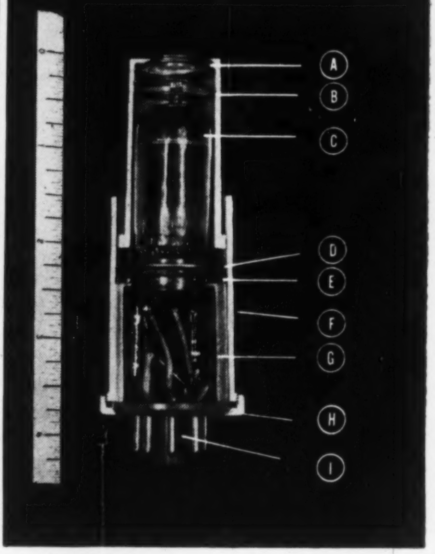

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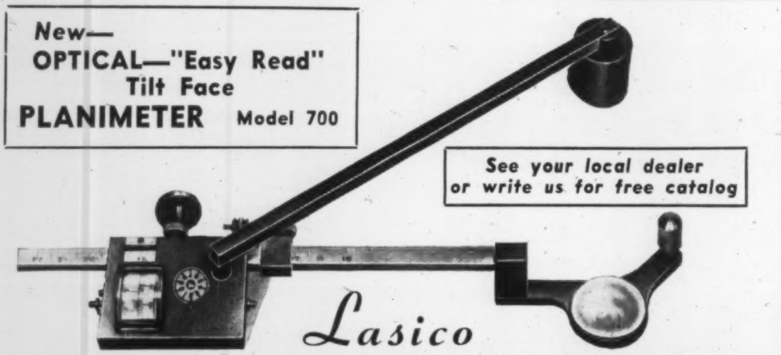

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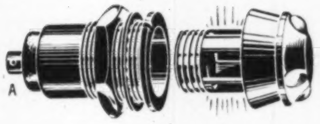

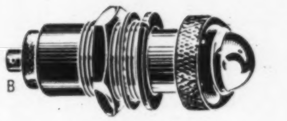

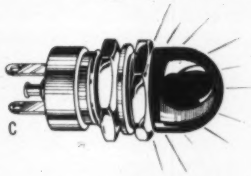

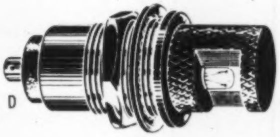

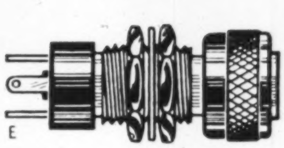

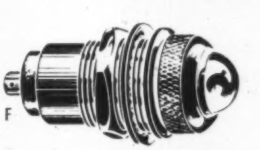

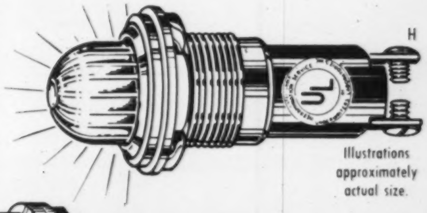

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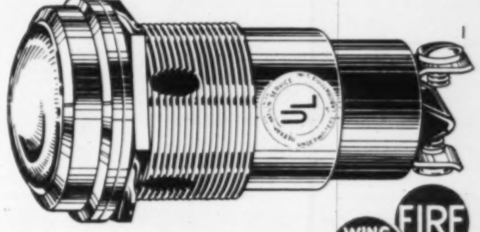

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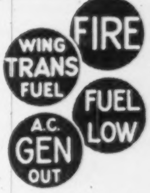

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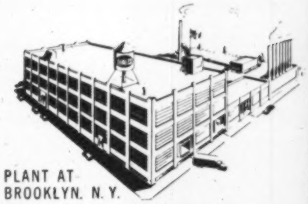

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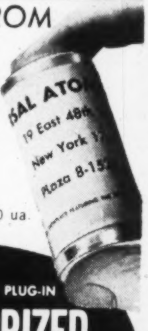

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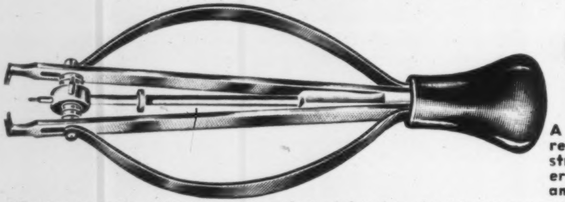

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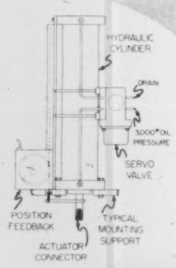

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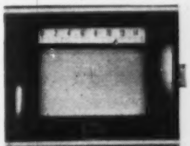

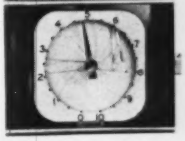

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BOURNS *TRIMPOTS*—the ultimate in sub-miniaturization—are used for circuit trimming in miniaturized assemblies subjected to extreme environmental conditions.

BOURNS many years of experience in specialized potentiometer instrumentation, plus modern production facilities, assure you of the highest quality instruments attainable.

* TRADE MARK

TRIMPOT*
1/2 ACTUAL SIZE
LINEAR MOTION
GAGE PRESSURE
ABSOLUTE & DIFFERENTIAL PRESSURE
ACCELEROMETER

BOURNS LABORATORIES
6135 Magnolia Avenue, Riverside, California

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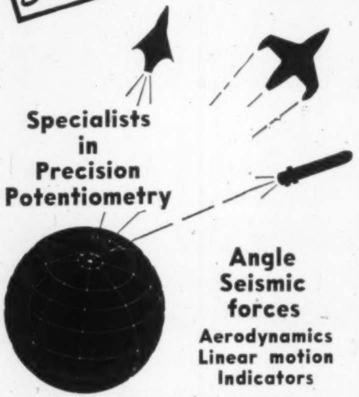
For more information circle **262** on inquiry card.

Edcliff INSTRUMENTS



- **LINEAR MOTION TRANSLATORS**
Single or multiple resistance elements with resistance values determined by customer requirements & wire limitations. Direct coupling renders accuracy to .001" or better.
- **PITCH-YAW INDICATORS**
True pitch-yaw indication with .1° accuracy or better depending upon resistance. High temperature components enable use at high mach numbers.
- **LINEAR MOTION ACCELEROMETER**
High overall accuracy with minimum "crosstalk" error. Ranges from ±0.25g through 100 gs with resistance values to 20,000 ohms.
- **PENDULUM INDICATOR**
Precision indication of single axis rotation.

Submit your problems to our experienced engineering staff.

SEND FOR LATEST CATALOG

Edcliff Instruments
383 N. Foothill Blvd., Pasadena 8, Calif.

For more information circle **263** on inquiry card.

TOPP

...follows through on your electronic control problems

Many industries are currently depending on the *complete* electronic control service for which TOPP is known—a service which includes consultation, design, manufacture of components and systems, and supporting test equipment. TOPP's recently expanded operations offer you extraordinary facilities in the solution of your electronic and electro-mechanical equipment problems. Rely on TOPP's history of dependability in aircraft and missiles components, and related fields.

Among TOPP's best known products are

- → Precision Potentiometers—linear and non-linear, sector and rectilinear types
- → Micro-positioner tables
- → Angle-of-Attack and Side-slip systems
- → Miniaturized Analogue Computers
- → Mach Sensing Devices
- → Mach Switches
- → Intervalometers
- → Engine Ice Detection Systems
- → Miniature Preamplifiers
- → Subsonic Wind Tunnels—portable and non-portable
- → 3-axis Dampening Systems
- → Flap Position Indicators
- → Arming Mechanisms
- → Special Hydraulic and Electro-Hydraulic Cylinders and Valves

For information and consultation on these and other products, write or wire

TOPP
INDUSTRIES, INC.
5255 West 102nd Street
Los Angeles 45, California

For more information circle **264** on inquiry card.

Borg Corp.
Bourns Labs.
Bristol Co.
Brown Electro Meas.
Burton Mfg.
Carter Parts Co.
Centralab Div.
Clarostat Mfg. Co.
Colvin Labs.
Computer Instrument Corp.
Corbett Science Labs., F. W.
Daven Co.
Daystrom Inst.
De Jur-Amsco Corp.
Donner Scientific
Edcliff Instruments
Electro-Measurements
Electro-Mec Lab.
Electronic Associates
Elektro-Serv Co.
Fairchild Camera
  (Pot. Div.)
Feedback Controls
Fieler Engineering
Ford Engineering
Ford Instrument
Foxboro Co.
G. E. Apparatus Sales
General Radio Co.
Genisco, Inc.
Giannini & Co.
Gray Instrument
Helipot Corp.
Humphrey, Inc.
Hycor Co., Inc.
International Resistance
Jarvis Electronics Corp.
Leeds & Northrup
Mann Co., Wm. I.
Markite Corp.
Micromax Co.
Natl. Elec. Controller
Ohmite Mfg.
Pacific Scientific
Paul & Stein
Perkin-Elmer
Precision Resistance Co.
Rattray & Co., Geo.
Rex Rheostat
Robertshaw-Fulton Co.
Rubicon Co.
Servonic Instruments
Shallcross Mfg.
Specialties, Inc.
Spectrol Corp.
Summers Gyroscope
Technology Inst. Corp.
Thwing-Albert Inst.
Topp Industries
United Optical Mfg.
Vectron, Inc.
Ward Leonard Elec.
Waters Mfg.
West Instrument

POWDERED MATERIALS
(See Granular Materials)

POWER FACTOR INDICATORS

Boonton Radio Corp.
Clough-Brengle Co.
Elec. Facilities, Inc.
Electronic Instrument
Feiler Engineering
GE Apparatus Sales
General Radio
Hickok Elec. Inst. Co.
Industrial Test Equip.
Leeds & Northrup Co.
Metrotype Corp.
Physics Research
Roller-Smith Co.
Sensitive Research Inst.
Technology Instruments
Triplett Elec. Inst.
United Optical Mfg.
Westinghouse Elec.
Weston Electric Inst.

POWER FACTOR RECORDERS

Bristol Co.
Elec. Facilities
Esterline-Angus Co.
GE Apparatus Sales
Industrial Test Equip.
Leeds & Northrup Co.
Metrotype Corp.
Roller-Smith Co.
Sangamo Electric
Sorenson & Co.
Westinghouse Elec.

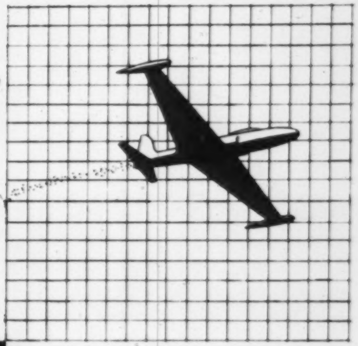
POWER FACTOR REGULATORS

American Kloeckner
GE Apparatus Sales
Leeds & Northrup
Modern Controls
Sangamo Electric
Shallcross Controls
Westinghouse Elec.

POWER-LEVEL INDICATORS

Amplifier Co.
Audio Instrument
Bristol Co.
Clough-Brengle Co.
Columbus Products Corp.
Daven Co.
De Jur-Amsco
Electronic Dev. Lab.
Feiler Engineering
General Elec. Co.
General Radio Co.
Hickok Elec. Inst. Co.
Kearfott
Leeds & Northrup
Marion Electrical Inst.
Polytechnic Res. & Dev.
RCA Div.
Reed Research
Sensitive Research Inst.
Shallcross Mfg. Co.
Sound Apparatus Co.
United Optical Mfg.
Westinghouse Elec.
Weston Elec. Inst.

General Scientific



GENERAL SCIENTIFIC CORP.
12027 Vose Street
North Hollywood
California

INSTRUMENTS AND COMPONENTS OF HIGH PRECISION

"that's the GENERAL idea"

- **PRECISION WIRE-WOUND POTENTIOMETERS**
- **ACCELEROMETERS**
- **PRESSURE TRANSDUCERS**
- **TEMPERATURE TRANSDUCERS**

Model M10-3000

Model M10-1000

Model M10-2000

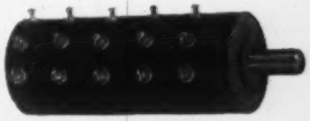
LEFT: TEN TURN POTS

Data	M10-1000	M10-2000	M10-3000
Housing dia.	1"	¾"	1⅞"
Resist. Range	100 ohm to 150K	100 ohm to 75K	1 ohm to 500K
Std. Lin. Tol.	±0.5%	±0.5%	±0.5%
Wattage Rating	3 W	2 W	5 W

●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

RIGHT: SINGLE TURN POTS

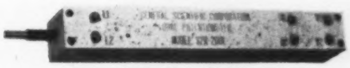
Data	S1 3000	S1 5000
Housing dia.	2"	1"
Resist. Range	5 ohm to 100 K	5 ohm to 50 K
Std. Lin. Tol.	±0.5%	±2%
Wattage Rating	4 W	1.5 W



Model S1-5000

●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

RECTILINEAR POTS



Model 2R-2000

Four "standard" products, with many variations possible. Let us develop a Rectilinear Potentiometer to your specific needs.

WRITE US FOR BROCHURES ON POTENTIOMETERS

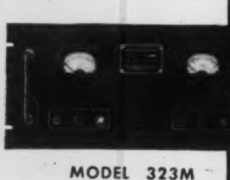
For more information circle **265** on inquiry card.

OVER 10,000 HOURS

OF CONTINUOUS TROUBLE-FREE OPERATION . . .

Reliable CURRENT OR VOLTAGE STABILIZED

POWER SUPPLIES

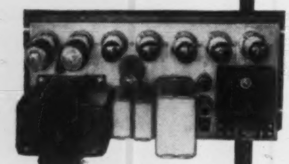


MODEL 323M
200-325 VDC
0-300 MA.
6.3 VAC. 6A

An installation of ten *standard* models in a data processing system at a large Municipal airport has been in continuous operation for a full year *without breakdown or tube replacement.* Yet this high order of performance has been achieved without affecting the moderate cost of these equipments.

Typical of the instruments in this line is the Model 323M as shown. Occupying only 8¾" of rack space, and 9" deep, it provides a regulation of 0.1%, a maximum ripple of 1 millivolt and a response time of 150 microseconds.

WRITE FOR COMPLETE CATALOG NX



with Weston 3½" Meters
$199⁵⁰
available less meters
$169⁵⁰

Power Designs inc.

119-22 ATLANTIC AVENUE
RICHMOND HILL 19, NEW-YORK

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POWER SUPPLIES, Regulated

ACF Electronics
Aerovox Corp.
Ahrendt Inst. Co.
AiResearch Div.
Airpax Products
American Electroneering
American Electronic Labs.
American Rectifier
American Tradair
Anton Electronic Labs.
Applied Science Corp.
Arga Div.
Associated Research
Associated Specialties
Atlas Engineering
Atomic Inst.
Austin Co.
Authorized Mfrs. Service
Bart-Messing
Bendix Red Banks Div.
Beta Electric
Beva Labs.
Bogue Elec. Mfg. Co.
Booth Co.
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Cal-Tronics Corp.
Chapman Labs.
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Computer Eng.
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ConRay Corp.
Cornell-Dubilier
Del Electronics
Devtronics, Inc.
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Douglas Instrument Labs.
Dressen Barnes Corp.
E. C. Apparatus Co.
EECO Production
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Electro Products Labs.
Electro-Tech Equip.
Electronic Inst.
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Electrosig Corp.
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Empire Devices
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F.R. Machine Works
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Fluke Mfg.
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General Magnetics
General Radio
Heller Co., G.K.
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Hewson Co., John
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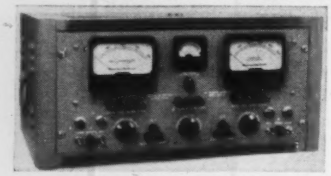
I-L-S Instrument
Industrial Electronics
Industrial Test Equip.
Inet, Inc.
Jersey City Tech. Lab.
Kahn & Co.
Kalbfell Labs.
Kay-Lab.
Keithley Instruments
Kepco Labs.
Keystones Products
Krohn-Hite Inst., Co.
Laboratory for Electronics
La Marche
Lambda Electronics
Langevin Mfg. Corp.
Lessels & Assoc.
Levinthal Electronic Prod.
Link Aviation
Mag Electric Products
Magnetic Amplifier
Magnetic Instrument
Magnetic Research
Manson Labs.
Massa Labs.
McColphin-Christie
Metrotype Corp.
Meyer & Co., Hugo
Miller Corp., Wm.
Millivac Instruments
Model Rectifier
Moran Electronic Components
Nalley, Leonard L.
Natl. Inst. Labs.
Neutronic Associates
New Haven Clock
New Jersey Electronics
Nuclear Chicago
Nuclear Research
Opad Electric
Oregon Electronic
Owen Labs.
Pacific Scientific
Perkin Engineering
Peschel Electronics
Philamon Labs
Philbrick Researches
Phoenix Precision Inst.
Plastic Capacitors
Polytechnic Res. & Dev.
Power Designs
Power Equipment
Precise Development
Precise Measurements
Process & Instruments
Radiaphone Co.
Radiation Inst. Dev. Lab.
Raytheon Mfg.
Research Specialties
Richardson-Allen
R. S. Electronics
Schauer Mfg.
Scientific Specialties

REGULATED DC POWER SUPPLIES

Designed For:



Twin Model 500 AT-2
0-500 V, 0-200 Ma each side

ϕ Research & Experiment

ϕ Test & Measurement

ϕ Varied Industrial Use

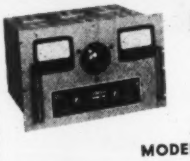
Single and twin models. Ranges, 0-10,000 V, 0-50 Amps. High Stability. Top quality components. Order from stock or inquire about custom design service. *Literature on request.*

UNIVERSAL ELECTRONICS CO. 1720 TWENTY-SECOND ST., SANTA MONICA, CALIFORNIA

*U*nexcelled *E*fficiency

For more information circle **267** on inquiry card.

Opad D.C. POWER SUPPLIES



NEW AIRCRAFT BATTERY ELIMINATOR

MODEL KM88

0 - 28 V.D.C., 20 Amperes, 1% Ripple

Request Bulletin No. 100

MOTOR SPEED CONTROL

for

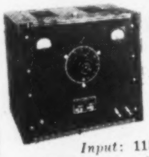
- COIL WINDERS
- LATHE FEEDS & DRIVES
- DRILLING & TAPPING
- PRECISION GRINDERS
- CONVEYOR SYSTEMS

MODEL RM5

Input: 115 *V.A.C., 60 cycles, Single Phase*

For 1/15 H.P., 115 V.D.C. SHUNT WOUND MOTORS

Request Bulletin No. 800



GENERAL PURPOSE

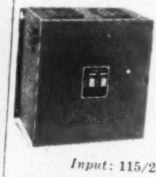
for

- MOTORS
- RELAYS, SOLENOIDS
- M-G SETS
- ELECTRO-PLATING
- BATTERY CHARGING
- CONTACTORS, STARTERS

Input: 115 *V.A.C., 60 cycle Single Phase*

OUTPUT:	AVAILABLE IN CURRENT RANGES:
0-6 V.D.C.	25 — 50 — 150 Amperes
0-12 V.D.C.	12 — 25 — 50 Amperes
0-28 V.D.C.	10 — 20 — 40 Amperes

Request Bulletin No. 178



POWER CONVERSION

for

- MOTORS
- GENERATOR FIELDS
- RELAYS, SOLENOIDS
- MAGNETIC CHUCKS
- BRAKES, CLUTCHES

Input: 115/230 *V.A.C. 60 cycle Single Phase*

OUTPUT: 115 or 230 Volts D.C.

Standard Models available in the following wattages: 125, 250, 375, 500 and 1000 Watts.

Request Bulletin No. 600

New O-PAC*

The "FORWARD LOOK" in AC operated self-contained DC Power Packs, offering compactness and ease of installation. Available in wide variety of ratings, for 60 and 400 cycle inputs.

*Packaged DC Power Packs

Request Bulletin No. 185

Opad ELECTRIC COMPANY

69-5 MURRAY STREET • NEW YORK 7, N. Y.
Telephone: BEekman 3-7548

For more information circle 268 on inquiry card.

NEUTRONIC

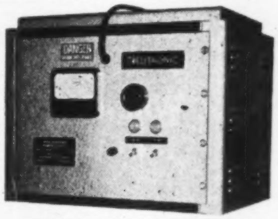
REGULATED

HIGH VOLTAGE POWER SUPPLIES

RF-DC POWER SUPPLY UNITS

REVERSIBLE POLARITY UNITS

Model	Voltage Range	Current Range	Regulation
R-21K	1-10 KV	10 ma @ 5 KV	——
R-21KR	1-10 KV	10 ma @ 5 KV	½%
R-22C	3-26 KV	2 ma @ 18 KV	——
R-22CR	5-26 KV	2 ma @ 18 KV	½%
R-22M	5-30 KV	3 ma @ 20 KV	——
R-22MR	5-30 KV	3 ma @ 20 KV	½%
*R-22SR	5-30 KV	2 ma @ 30 KV	½%
*R-52SR	5-50 KV	2 ma @ 30 KV	½%



SINGLE POLARITY UNITS

21K	1-10 KV	10 ma @ 5 KV	——
21KR	1-10 KV	10 ma @ 5 KV	½%
21M	1-12 KV	6 ma @ 10 KV	——
21MR	1-12 KV	6 ma @ 10 KV	½%
22C	3-26 KV	2 ma @ 18 KV	——
22CR	5-26 KV	2 ma @ 18 KV	½%
22M	5-30 KV	3 ma @ 20 KV	——
22MR	5-30 KV	3 ma @ 20 KV	½%
23C	5-40 KV	1.3 ma @ 25 KV	——
23CR	5-40 KV	1.3 ma @ 25 KV	½%
23M	5-45 KV	1.5 ma @ 30 KV	——
23MR	5-45 KV	1.5 ma @ 30 KV	½%
24C	5-50 KV	1 ma @ 35 KV	——
24CR	5-50 KV	1 ma @ 35 KV	½%
24M	5-55 KV	2 ma @ 30 KV	——
24MR	5-55 KV	2 ma @ 30 KV	½%
*23S	3-35 KV	3 ma @ 30 KV	——
*23SR	5-35 KV	3 ma @ 30 KV	½%
33S	1-30 KV	4.5 ma Entire Range	——
*52SR	5-50 KV	2 ma @ 45 KV	½%

* The above "S" type units come with a separate plate supply—rack mounted.

Prices range from $310 to $970

All models can be modified to a regulation of 1/10% or to your individual specifications

Write for additional information and price list

NEUTRONIC
ASSOCIATES

87-16 116th St., Richmond Hill, L.I., N.Y.
VIrginia 7-7703

For more information circle **269** on inquiry card.

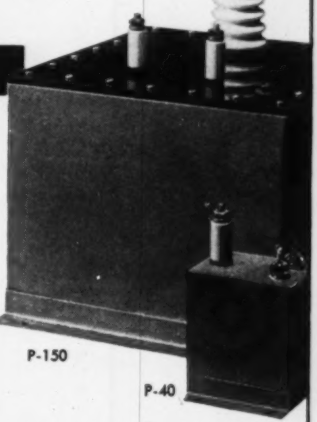
HV

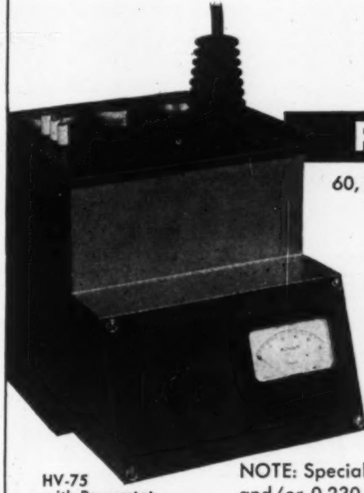
Here are three of a group of High Voltage items developed by Microtime Laboratories for their instrumentation for the radiographic recording of ultra speed phenomena. *Each has applications in other, unrelated fields.*

PULSE TRANSFORMERS

Compact autotransformers designed to produce high voltage pulses of short duration. Used as single shot high voltage triggers (as in X-ray pulse generator and Kerr cell circuits) and in pulse circuits where relatively low repetition rates are required.

MODEL	SIZE	Plus Terminal	MAX. INPUT	MAX. OUTPUT
P-150	7"x 8"x 6" high	3"	± 11 KV	± 150 KV
P-40	2¾"x 1½"x 2¾"	1"	± 3 KV	± 40 KV




HV-75
with Powerstat

POWER SUPPLIES

60, 75, 100 or 200 KV. Compact. Exceptional safety.

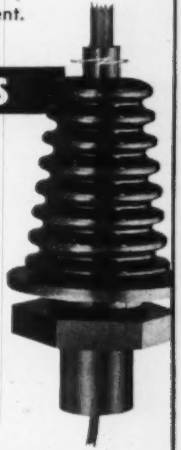
SERIES **HV**: AC primary voltage of HV transformer may be varied independently of filament voltage. Powerstat and associated meter available—mounted on unit if desired.

SERIES **HVA**: basic *HV* plus separate AC control. Supply and control units are in completely enclosed cabinets.

Positive or negative polarity. Input voltage 115 VAC. Continuous current output 1 ma.

NOTE: Special units provide reversible polarity and/or 0-230 VAC and/or additional current.

CONCEALED-DISCONNECT BUSHINGS



Superior to ceramic bushings: connection of HV source with output lead is deeply within unit—corona completely eliminated, maximum safety provided operator.

Molded of tough, flexible resin of high impact and dielectric strength. Dielectric and design permit finer performance, reduced size—advantageous where restricted space precludes internal bushing. Copper sleeve at contact curtails bombardment breakdown.

60 and 100 KV units handle 1.5 KW, special units for higher wattages. Height 5¾" (2¾" above base of mounting flange), base diam. 3½". Operating temperature: —50° C to 150° C.

Inquire about our HV Capacitors, X-ray Pulse Generators, Kerr Electro-optical Shutters, Fine Focus Flash X-ray Tubes, Microsecond Multiple Time Delay Generators.

We invite extraordinary commissions.

MICROTIME LABORATORIES

7247 ATOLL AVENUE, NORTH HOLLYWOOD, CALIFORNIA

For more information circle **270** on inquiry card.

TABTRON

FOR ALL DC POWER REQUIREMENTS
HIGH CURRENT PWR SUPPLIES

Variable 0-28VDC. Completely Built. Ready to Go. Full Wave Selenium Rectifier, Transformer, Variac, Volt & Amp Meters, Switch, Terminals & Fuse. In Heavy Duty Steel Cabinet. Std 115 Volt 60 Cy. In OR 220V‡ (3 phase) to order.

Stock No.	Cont. Rating	W/Meters
T28V5A	0-28VDC at 5 Amp	$ 45.00
T28V5ACC	5 Amp 1% Ripple	75.00
T28V5A2CC	5 Amp 0.01% Ripple	129.00
T28V12A	0-28VDC at 12 Amp	108.00
T28V12ACC	12 Amp 1% Ripple	145.00
T28V24A‡	0-28VDC at 24 Amp	135.00
T28V24ACC‡	24 Amp 1% Ripple	195.00
T28V50A‡	0-28VDC at 50 Amp ...	260.00

VARIABLE DC LINE SUPPLY

Variable 75-135VDC. Completely Built. Ready to Go. Includes F. W. Selenium Bridge Rectifier, Filter, 4" Rectangular Volt & Ammeter, Overload cut out & components as in other supplies. Designed for cont. service. SPECIFY for 115 OR 230 VAC/60 Cycle/1 phase.

T120V5AC	75-135VDC at 5 Amp	$170.00
T120V5ACC	5 Amp 1% Ripple	218.00
T120V10AC	75-135VDC at 10 Amp ..	216.00
T120V10ACC	10 Amp 1% Ripple	266.00

NEW! BASIC SUPPLY

DC Power Supplies consisting of Transformer & Full Wave Bridge Selenium Rectifier. Mtd Wired. Std. 115V In OR 230 VAC‡ to oder, SPECIFY. Hvy Steel Cabinet. **Less Meters.**

B12V10A	12VDC at 10 Amp	$ 39.00
B12V10ACC	10 Amp 1% Ripple	65.00
B12V24A	12VDC at 24 Amp	81.00
B12V50A	12VDC at 50 Amp	125.00
B28V5A	28VDC at 5 Amp	35.00
B28V5ACC	5 Amp 1% Ripple	49.00
B28V12A‡	28VDC at 12 Amp	75.00
B28V24A	28VDC at 24 Amp	110.00
B115P5A	115VDC at 5 Amp	90.00

C "TAB" FOR FAST DELIVERY SPECIALS

NEW "TABTRON" SELENIUM RECTIFIERS
ENGINEERED for INDUSTRY

"TAB" manufactures power rectifiers to your specifications. From one amp up to and above 1000 amps, convection or fan cooled, single or 3 phase. "NEMA" & JAN. Specs. Write for catalog.

***FULL WAVE BRIDGE • DATED & ONE YEAR GTD**

Max Amp	18VAC* 14VDC	36VAC* 28VDC	54VAC* 42VDC	72VAC* 56VDC	130VAC* 100VDC	266VAC* 217VDC	Ctr Tap AC/DC 30/12	3 Phase Bridge 240VAC 300VDC	420VAC* 460VDC
1	$1.40	$2.35	$3.75	$4.50	$8.25	$22.25	$2.10	$28.95	$54.95
2	2.10	2.95	5.35	5.90	10.00	28.85	2.35	30.90	58.25
3	3.00	4.15	5.85	7.85	12.75	36.85	2.65	33.50	67.50
4	3.70	7.35	11.35	14.35	24.75	38.85	2.95	36.95	71.25
6	4.45	8.75	12.85	17.30	32.00	54.85	3.25	39.95	78.95
10	6.50	12.50	19.50	24.80	41.35	84.85	4.75	71.95	141.35
12	8.00	15.75	22.10	29.75	44.25	99.85	5.95	81.95	161.75
20	13.05	25.05	37.25	48.75	78.50	160.85	7.95	97.95	193.35
24	16.00	31.95	44.50	57.65	85.00	190.85	9.95	159.95	314.95
30	19.75	33.50	56.50	71.00	109.00	235.85	Q	225.95	449.95
36	24.75	47.50	65.00	86.95	134.00	295.85	14.95	269.95	531.50
50	29.50	54.35	97.35	106.35	174.00	405.35	23.95	359.95	714.95
100	58.15	108.15	189.15	210.15	340.15	790.15	45.15	675.15	$1434.
200	114.60	209.95	369.50	409.85	672.50	$1565.	Q	$1339.	$2862.

Write for Our Brand NEW Power Supply & Rectifier CATALOG PR655

NEW RECTIFIER CHOKES

CR6001	1 AMP/0.1	HY/1.4 OHM....	$3.95
CR6002	2 AMP/0.1	HY/.67 OHM.....	5.95
CR6003	5 AMP/.07	HY/.6 OHM......	7.95
CR6004	12 AMP/.01	HY/.1 OHM......	14.95
CR6005	24 AMP/.004	HY/.025 OHM ...	29.95

NEW RECTIFIER XFMRS

Sec (Dual‡) 18-15-9-0:0-9-15-18 volts

5 AMP‡	......$8.65;	2 for $15.75
12 AMP‡	......16.65;	2 for 29.95
24 AMP‡	......35.65;	2 for 69.95
50 AMP*	......59.00;	2 for $112
100 AMP*	......$108;	2 for $210

*Dual Primary 115/220v 60 cy; Tap Sec ‡Wndgs in series at ratings shown; Parallel 2x Amps, Voltage One-half max.

ALL PRICES SHOWN SUBJECT TO CHANGE

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109 LIBERTY ST., NEW YORK 6, N.Y.
CABLE: "TABPARTS PHONE RECTOR 2-6245

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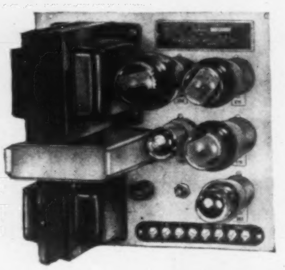

ELECTRONICALLY REGULATED D. C. CONSTANT VOLTAGE POWER SUPPLIES

The output voltage is continuously variable from 200 to 325 volts D.C. for load currents of 0 to 100 M.A. with an input voltage of 105 to 125 volts 60 cycle. Regulation is better than 1%. An isolated A.C. voltage of 6.3 volts at 3 amperes is available at the output terminal connections.

MODEL 2 SUB-CHASSIS MTG.	$49.50
MODEL 1 RELAY RACK MTG.	$52.50

ASSOCIATED SPECIALTIES CO.
1751 MAIN STREET
OREFIELD, PENNSYLVANIA

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Servo Corp. of America
Shallcross Mfg.
Shasta Div.
Sola Electric
Sorenson & Co.
Southwestern Indus. Elec.
Specialties Inc.
Spellman TV Corp.
Spinco Div.
Standard Transformer
Superior Electric
T A B
Telechrome, Inc.
Teletronics Lab
Triumph Mfg. Co.
Universal Atomics
Universal Electronics
Varian Associates
Varo Mfg. Co.
Vectron, Inc.
Vickers Elec. Div.

PRECISION-BORE GLASS TUBING

Ace Glass Inc.
Brooks-Rotameter
Corning Glass Works
Crystal Glass Tube
Fischer & Porter
Fish-Schurman Co.
Fredericks Co., Geo.
Greiner Glassblowing Lab.
Gurley, W. & L. E.
International Dev. Co.
Kontes Glass Co.
Martin & Co.
Mercury Glass Co.
Owens Illinois Glass
Phoenix Prec. Inst.
Podbielniak, Inc.
Porter, George K.
Sampson Chem.
Scientific Glass App.
Wilmad Glass Co., Inc.

PRECISION-BORE METAL TUBING

Precision Tube Co.

PRECISION INSTRUMENT PARTS

Swissomatic Products

PRESSES, Laboratory

Acromark Co.
American Inst. Co.
Amsler Buehler
Anderson Bros. Mfg. Co.
Baldwin-Lima-Hamilton
Carver, Fred S.
Central Scientific Co.
Denison Engineering
Emmett Machine
Logan Engg. Co.
Mico Inst. Co.
Microchemical Service
Newmatic Corp.
Pasadena Hydraulics
Soiltest, Inc.
Studebaker Hydraulic
Testing Machines, Inc.
Wabash Metal Products
Welch Scientific
Williams Apparatus

PRESSES, Miniature Drill

Phillips P. Hiss

PRESSES, Pellet

Black & Webster
Central Scientific Co.
Denison Engineering
Dietert Co.
Fisher Scientific
Hannifin Mfg. Co.
Microchemical Service
Parr Instrument Co.
Precision Scientific
Stokes Machine Co.
Studebaker Hydraulic
Testing Machines, Inc.
Wabash Metal Products

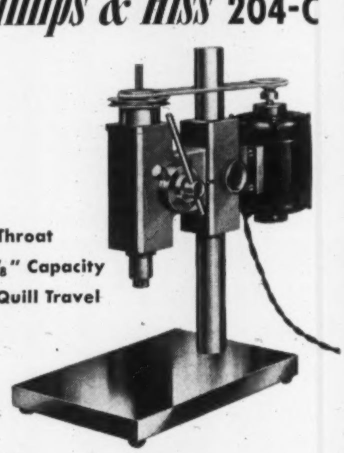
PRESSURE CONTROLLERS, AUTOMATIC (See Controllers, Automatic, Pressure)

PRESSURE, High (Above 1000 lbs.) Indicators

Acme Gauge
Acra Regulator
Aeroquip Corp.
American Chain & Cable
American Instrument
American Mach. & Metal
Ashton Valve Co.
Atlas Valve Co.
Autoclave Engrs. Inc.
Automatic Temp. Control
Bacharach Indus. Inst.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bourns Labs.
Bristol Co.
Brooks Eng. Co.
Cameron Iron Works
Coleman Inst. Co.
Control Engineering
Clark Cooper Co.
Cook Electric
Crosby Steam Gage
Dickson Co.
Dillon & Co., W. C.
Electro Prod. Lab
Electronics Products Co.
Elematic Equip. Corp.
Emery Co., A. H.
Fisher Governor Co.
Foxboro Co.
Giannini & Co.
Gilmore Industries
Gotham Inst. Co.
Hays Corp.
Heise Bourdon Tube Co.

Precision drilling made easy!

Phillips & Hiss 204-C



6" Throat
0-⅛" Capacity
1" Quill Travel

Sensitive "Feel"

Sensitive Speed Control: Foot-operated, leaves both hands free

High Precision: Selected Chuck and Bearings. Spindle true within .0002". Table square .0005" in 5" circle. Permanent accuracy, castings annealed and ground.

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micro-mechanics

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FOR ALL-AROUND LABORATORY WORK
there are no finer presses than **WABASH**

● Models from 3 Ton to 50

Precision construction, sturdiness, convenience and dependability are reasons for the popularity of Wabash hydraulic laboratory presses. With such quality features as chrome plated columns . . . precision bored guide holes . . . parallel platens sturdy hydraulic jacks and many others, they are outstanding in quality—yet reasonably priced.

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- Plastic forming, molding
- Extrusion Tests
- Laminating
- Card & Badge Laminating
- Vulcanizing
- Transoptic Specimen mounting
- Briquetting
- Pressing out oils, waxes, etc.
- Embossing
- Compression testing
- Drawing and Forming
- Dehydrating
- Breaking Tests
- Crushing Tests
- Spring Testing
- Adhesive testing
- Liquid-Solid Separation
- Pressure filtering
- Juice, sap extraction
- Vaccines, vires pressing

The NEW 30 Ton Model

We'll be glad to tell you more about WABASH presses and who uses them

WRITE TODAY TO . . .

WABASH METAL PRODUCTS CO.
WABASH, INDIANA

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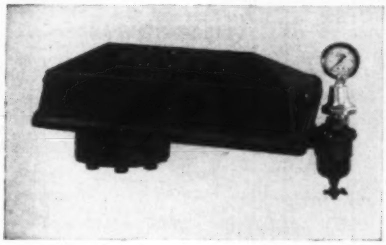

REPUBLIC
PNEUMATIC TRANSMITTERS

Republic pneumatic transmitters are devices for converting process variables, such as flow, liquid level, pressure or liquid density, into air pressures which vary proportionally with the process variables.

These air pressures can be used as the measuring impulse for the actuation of an automatic controller or a direct reading recorder.

WRITE FOR DATA BOOK No. 1002

REPUBLIC FLOW METERS CO.
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REPUBLIC
INSTRUMENTS • CONTROLS

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Industrial Electronics
Industrial Inst.
Jackson Co., Byron
Kollsman Inst. Co.
Leeds & Northrup
Linde Air Products Co.
Manning, Maxwell & Moore
Mansfield & Green
Marsh Corp.
Marshalltown Mfg.
Mason Neilan Regulator
McAlear Mfg. Co.
Meriam Inst. Co.
Miller-Robinson
Minneapolis-Honeywell
Moore Products
Norden-Ketay
Penn. Indus. Inst. Div.
Photocon Research Prods.
Rahm Insts.
RCA Div.
Republic Flow Meters
Ruge-de Forest, Inc.
Ruska Inst. Corp.
Rutico, Inc.
Servonic Instruments
Sheffield Corp.
Statham Labs.
Streeter-Amet Co.
Swartwout Co.
Taylor Inst. Cos.
Thrush & Co., H. A.
Trerice Co.
United Electric
United Instrument
U. S. Gauge
Weksler Thermometer
Weston Elec. Inst.
Wiancko Engineering

PRESSURE, High (Above 1000 lbs.) Recorders

Aeroquip Corp.
American Inst. Co.
Annis Co.
Autoclave Engrs. Inc.
Automatic Temp. Control
Bacharach Indus. Inst.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bourns Labs.
Bristol Co.
Builders-Providence
Cambridge Inst. Co.
Clark Cooper Co.
Commercial Research
Cook Electric
Crosby Steam Gage Co.
Dickson Co.
Emery Co., A. H.
Esterline-Angus Co.
Foxboro Co.
Gilmore Industries
Gotham Inst. Div.
Hathaway Inst. Co.
Hays Corp.
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Industrial Inst.
Leeds & Northrup
Linde Air Products Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Minneapolis-Honeywell
Moore Products
North American Inst., Inc.
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Photocon Research
Rahm Instrument
Republic Flow Meters Co.
Ruge-de Forest Inc.
Schaevitz Engg.
Sheffield Corp.
Statham Labs.
Streeter-Amet
Swartwout Co.
Taylor Inst. Cos.
Trerice Co.
United Electric
U. S. Gauge Co.
Weksler Thermometer
Weston Elec. Inst.

PRESSURE, HIGH (Above 1000 lbs.) Testing Devices

American Inst. Co.
Ashton Valve Co.
Autoclave Engrs.
Bacharach Indus. Inst.
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Bourns Labs.
Bristol Co.
Builders-Providence
Carver, Fred S.
Chatillon & Sons
Cook Electric
Crosby Steam Gage Co.
Dillon & Co., W. C.
Electro Products Labs.
Foxboro Co.
Hathaway Inst. Co.
Hawk Tool & Engr.
Industrial Electronics
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International Radiant
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Marsh Corp.
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Milton Roy Co.
Minneapolis-Honeywell
Parr Instrument Co.
Penn Ind. Inst. Co.
Pioneer Instrument
Pressure Products
RCA Div.
Refinery Supply Co.
Ruge-de Forest Inc.
Ruska Instrument
Rutico, Inc.
Sheffield Corp.
Statham Labs.
Streeter-Amet
Trerice Co.
United Electric
U. S. Gage

PRESSURE INDICATORS Bellows

Aeromarine Inst. Co.
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Autocall Co.
Automatic Temp. Control
Bailey Meter Co.
Barton Inst. Co.
Bendix Aviation
Bourns Labs.
Bridgeport Thermostat
Bristol Co.
Builders-Providence
Cook Electric Co.
Crosby Steam Gage Co.
Defender Inst. & Reg.
Dickson Co.
Edcliff Instruments
Ellison Draft Gage
Emery Co., A. H.
Engineering Res. & Dev.
Fischer & Porter
Foxboro Corp.
Genisco, Inc.
Giannini & Co.
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Hays Corp.
Industrial Inst.
Instrument Associates
Kollsman Instrument
Lonergan Co.
Manning, Maxwell & Moore
Marshalltown Mfg.
Mason-Neilan Regulator
Minneapolis-Honeywell
Moore Products
Norden-Ketay Corp.
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Precision Therm.
Rahm Instruments
Republic Flow Meters
Schaevitz Engg.
Servonic Instruments
Shallcross Controls
Summers Gyroscope
Taylor Inst. Cos
Trerice Co.
United Electric
U. S. Gauge
Wallace & Tiernan
Weksler Thermometer
Weston Elec. Inst.

PRESSURE INDICATORS, Bourdon-tube (See Gages, Bourdon)

PRESSURE INDICATORS, Diaphragms, etc.

Aeromarine Inst. Co.
American Paulin
Automatic Temp. Control
Aviation Engr. Corp.

PRESSURE Measurement ACCURACY 0.1%

W&T PRECISION DIAL MANOMETER, FA-145

Ranges: All ranges from 0-120 inches water through 0-250 inches Hg. in two revolutions—45 inch scale.

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Belleville 9, New Jersey . . . Represented in Principal Cities
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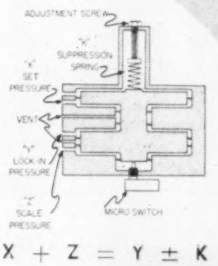

X + Z = Y ± K

W/C *PRECISION PNEUMATIC DIFFERENTIAL PRESSURE CONTROLLER*

● Three chambers + constant suppression spring ● High accuracy, excellent repeatability — 0.5" W.C. ● Control pressures set up to 50 psi ● 50 psi differential overpressure without shift ● Remote pneumatic set ● Control point unaffected by temperature changes ● Means of setting electrical on-off control from varying pressure inputs ● Spring adjustment to permit anticipatory control and/or constant preset over full range. Write for catalog giving complete details.

WEIGHING and Control COMPONENTS, INC.
64-X Fulmor Ave., Hatboro, Pa.

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ACTUAL SIZE

Flush-mounted pressure transducers for true phase and amplitude measurements. Diameters as small as ½ in., wide variety of forms and dynamic ranges.

Advantages of these transducers include:

(1) Small size and light weight.

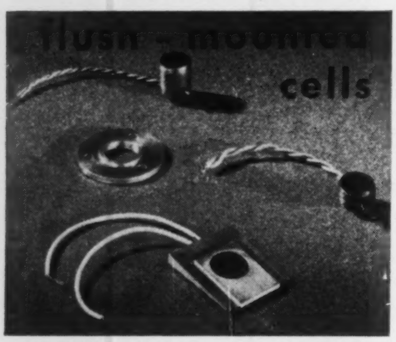
(2) Sensing diaphragm flush to the surface under pressure–eliminating phase and amplitude errors.

(3) Freedom from shock or acceleration effects.

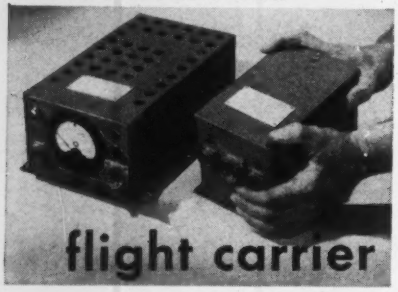
(4) Low first cost. Long, trouble-free service life.

(5) Simple calibration procedure.

(6) Usable with many existing systems of instrumentation.



Carrier amplifiers, both flight and laboratory types, feature: High gain (30 µv input for 1 ma output); low noise (pass band 0 to 500 cps ±2% flat); and automatic compensation for static zero-drift.

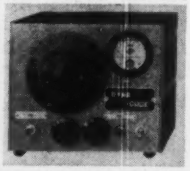


Electronic Engineering Associates, Ltd.

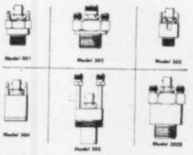
1040 BRITTAN AVENUE • SAN CARLOS, CALIFORNIA
LYtell 3-2189

For more information circle **279** on inquiry card.

DYNAGAGE DG-400



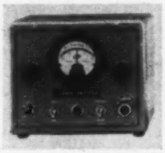
TRANSDUCERS



Measures static and dynamic pressures under adverse conditions up to 6000° F.

0-75,000 psi, output ±15 volts, 0-20,000 cps, water-cooled stainless steel transducers.

AMPLIFIER CA-401 DIRECT-COUPLED



Input ±600 mv, output ±40 ma, 0-100 ohm load impedance.

INSTRUMENTS

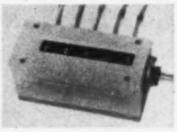
Designed and produced by

PHOTOCON RESEARCH PRODUCTS

421 N. FOOTHILL BLVD.
Pasadena, California

Write for full specifications & details

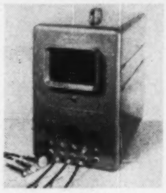
CONTROL COUNTERS



CC & PC 500

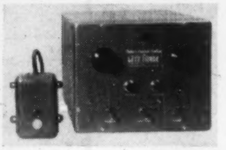
Precision contacting and potentiometer counters for telemetering and control systems.

METROSCOPE MS-101



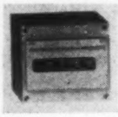
An ultrasonic instrument for measuring thickness of metals and checking flaws and bonds.

LITE-GAGE LG-402



Integrates or totalizes light output from arc lamps, etc. with automatic reset.

MAGNETIC COUNTERS



HIGH SPEED

MC-505AS—5 digit combination add and subtract.

MC-504 SZL—4 digit subtracting counter, 0-level control switch.

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Berkeley Scientific Div.
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Eclipse-Pioneer Div.
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Electro Products Labs
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Emery Co., A. H.
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Foxboro Co.
General Electric
Giannini & Co.
Gotham Inst. Div.
Hamilton Watch
Hays Corp.
Hoke, Inc.
Industrial Electronics
Industrial Inst.
Instrument Associates
Kollsman Inst. Corp.
Lonergan Co.
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Marshalltown Mfg.
Mason-Neilan Regulator
Matisa Equipment
Minneapolis-Honeywell
Moore Products
Norden-Ketay Corp.
North American Inst.
Penn Indus. Inst.
Photocon Research
Powers Regulator Co.
Republic Flow Meters
Rahm Instruments
Rochester Mfg. Co.
Ruska Inst. Corp.
Rutico, Inc.
Schaevitz Engg.
Scientific Enterprises
Shallcross Controls
Sheffield Corp.
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Stewart-Warner
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Swartwout Co.
Taylor Inst. Cos.
Topp Industries
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Trimount Inst. Co.
Ultradyne Eng'ng.
United Instrument
U. S. Gauge
Viking Instruments
Wallace & Tiernan
Weksler Thermometer
Weston-Elec. Inst.

PRESSURE INDICATORS, Electrical resistance

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Atlantic Research
Baldwin-Lima-Hamilton
Bourns Labs.
Bristol Co.
Brush Electronics
Colvin Labs.
Control Engineering
Cook Electric
Daytronic Corp.
Dynamic Instruments
Edcliff Instruments
Edison Inc., T. A.
Electro-Mec Lab.
Electro Products Lab.
Electronic Eng. Assoc.
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General Electric Co.
Genisco Inc.
Giannini & Co.
Gilmore Industries
Hamilton Watch
Hastings Inst. Co.
Hathaway Instrument
Industrial Electronics
Jackson Co., Byron
Manning, Maxwell & Moore
Minneapolis-Honeywell
Norden-Ketay Corp.
Polyphase Instrument
Rahm Instruments
Ramapo Eng'ng.
Rubicon Co.
Ruge-de Forest Inc.
Scientific Enterprises
Servonic Instruments
Shallcross Controls
Sheffield Corp.
Simpson Electric
Skaneateles Mfg. Co.
Statham Labs.
Stewart-Warner
Swartwout Co.
Technology Instrument
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Trimount Inst. Co.
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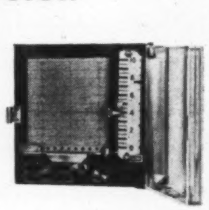
Miniature Graphic Panel instruments for pneumatic transmission

This new system measures, indicates, records and controls pressure (5 in. water to 10,000 psi), absolute pressure (5mm mercury absolute and up), temperature, vacuum, flow, differential pressure, liquid level, and mechanical motion.

The only instrument that fully carries out the Basic Graphic-panel idea. Includes full plug-in-service and continuous valve position indication. There are 35 receivers and 34 controller models and the widest variety of transmitters on the market. A model is available that will exactly meet every requirement.

Write for bulletins today.



Bristol
Metagraphic Recorder

BRISTOL COMPANY

112 Bristol Rd., Waterbury 20, Conn.

For more information circle **281** on inquiry card.

U. S. Gauge Co.
Weston Elec. Inst.

PRESSURE INDICATORS,
Inverted-bell

Automatic Temp. Control
Bacharach Indus. Inst.
Bailey Meter Co.
Bristol Co.
Crosby Steam Gage
Defender Inst. & Reg.
Dickson Co.
Ellison Draft Gage
Foxboro Co.
Hays Corp.
Magnetrol Inc.
Mason-Neilan Regulator
Minneapolis-Honeywell
Penn Industrial Inst.
Republic Flow Meters
Shallcross Controls
Taylor Inst. Cos.
Uehling Inst. Co.

PRESSURE INDICATORS,
Membrane

Aeromarine Inst. Co.
Dwyer Mfg.
Edcliff Instruments
Ellison Draft Gage
Hays Corp.
Penn Industrial Inst.
Republic Flow Meters
Rutico, Inc.
Taylor Instrument Cos.
Ultradyne Eng.

PRESSURE INDICATORS,
Piezoelectric

Atlantic Research
Brush Electronics
Chesapeake Inst. Corp.
Commercial Research
Control Devices
Crystal Research Labs.
Dyna Labs. Inc.
Endevco Corp.
Gulton Mfg.
Martin-Hubbard Corp.
Massa Labs.
RCA Div.
Scott, Inc., H. H.

PRESSURE INDICATORS,
Piston, Weight-Loaded

American Inst. Co.
Bailey Meter Co.
Coleman Inst. & Mfg.
Hagan Corp.
Ideal Lab. Tool
Industrial Electronics
Manning, Maxwell & Moore
Mansfield & Green
Republic Flow Meters

PRESSURE INDICATORS,
Single-tube, liquid column

Bacharach Indus. Inst.
Bristol Co.
Dwyer Mfg. Co.
Electronic Products Co.
Ellison Draft Gage
Gas. App. Specialties
General Mills
Hass Brothers Inst. Co.
Hays Corp.
Ideal Lab. Tool
Instruments, Inc.
King Engineering
Liquidepth Indicators
Manning, Maxwell & Moore
Meriam Instrument
Penn Indus. Inst.
Precision Therm.
Trimount Inst.
Uehling Instrument Co.
Wallace & Tiermnan
Welch Scientific

PRESSURE INDICATORS,
Spring-loaded piston

Bacharach Indus. Inst.
Cameron Iron Works
Commercial Research
Mansfield & Green

PRESSURE INDICATORS,
U-tube

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Amthor Test. Mach.
Automatic Temp. Control
Bacharach Indus. Inst.
Bailey Meter Co.
Bristol Co.
Connelly Inc.
Defender Inst. & Reg.
Dwyer Mfg. Co.
Electronics Products Co.
Ellison Draft Gage
Friez Instrument Div.
Gas App. Specialties
Gotham Inst. Div.
Greiner Glassblowing Lab.
Hays Corp.
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Bristol Co.
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Cook Electric
Crosby Steam Gauge
Defender Inst. & Reg.
Dickson Co.
Engineering Res. & Dev.
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Fischer & Porter
Foxboro Co.
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Hays Corp.
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Mason-Neilan Regulator
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Moore Products
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Powers Regulator
Republic Flow Meters
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INCHES
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Accuracy: 0.5%
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Sensitivity: 0.2%
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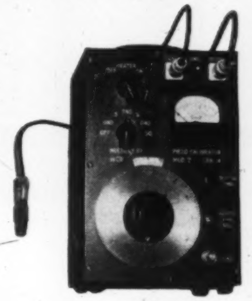

SPECIFICATIONS:

PRESSURE RANGE	0—2000 PSI
WITH ADAPTER	20 000 PSI
FREQUENCY RANGE	0—40 000 CPS
RESOLUTION	.01%
MAXIMUM TEMPERATURE	250° C
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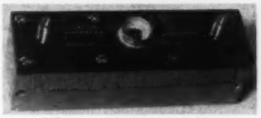

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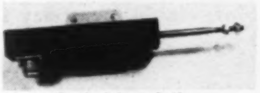

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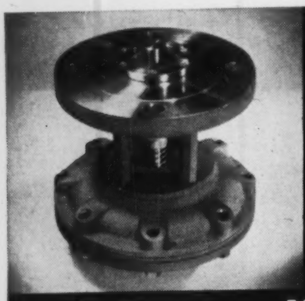

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Bristol Co.
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Century Instrument
Crosby Steam Gauge
Defender Inst. & Reg.
Dickson Co.
Electric Auto-Lite
Esterline-Angus Co.
Fischer & Porter
Foxboro Co.
Giannini & Co.
Gordon Co., Claud S.
Gotham Inst. Div.
Hays Corp.
Improved Gauge Mfg. Co.
Industrial Inst.
Kahl Scientific Inst.
Kenyon Instrument Co.
Leeds & Northrup Co.
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Minneapolis-Honeywell
Moeller Inst. Co.
Moore Products
Penn Ind. Inst. Div.
Powers Regulator
Republic Flow Meters
Schaevitz Engg.
Scientific Inst. Co.
Stoelting Co., C. H.
Streeter-Amet Co.
Summers Gyroscope
Taylor Inst. Cos.
Thrush & Co., H. A.
Trerice Co.
U. S. Gauge
Weksler Thermometer
Weston Elec. Inst.

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Century Inst. Co.
Cook Electric
Manning, Maxwell & Moore
Moore Products
Penn Ind. Inst. Co.
Republic Flow Meters
Scientific Inst. Co.
Weston Elec. Inst.

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Bristol Co.
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Burton Mfg.
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Matisa Equipment
Moore Products
Penn Ind. Inst. Div.
Powers Regulator
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Schaevitz Engg.
Sheffield Corp.
Swartwout Co.
Taylor Inst. Co.
U. S. Gauge
Weksler Thermometer
Weston Elec. Inst.

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Alleghany Instrument
Atlantic Research
Baldwin-Lima-Hamilton
Bourns Labs.
Bristol Co.
Electronic Eng'ng. Assoc.
Gilmore Industries
Hamilton Watch
Kybernetes Corp.
Larson Instrument
Swartwout Co.

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Foxboro Co.
Hays Corp.
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Penn Ind. Inst. Div.
Republic Flow Meters
Taylor Inst. Cos.
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Hays Corp.
Mason-Neilan Regulator
Penn Indus. Inst.
Republic Flow Meters
Rutico, Inc.
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Taylor Inst. Cos.

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Chesapeake Inst. Corp.
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Trimount Inst.
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Hays Corp.
Mason-Neilan Regulator
Penn Ind. Inst. Div.
Republic Flow Meters
Scientific Glass App.
Taylor Inst. Cos.
Trerice Co.
Trimount Inst.
Uehling Instrument Co.
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Smith Co., S. Morgan
Weksler Thermometer

(See Switches, Pressure) PRESSURE SWITCHES

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Bray Optical
Buchele Optical Co.
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Helio Instrument
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Jarrell-Ash Co.
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Kollmorgen Optical Co.
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Valpey Crystals
Wollensak Optical
Zenith Optical

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Avion Div.
Bausch & Lomb Optical
Engis Equipment
Ercona Corp.
Helio-Instrument
Opplem Co.
Schneider-Cogswell
Unertl Optical Co.
Williamson Dev.

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Corbett Science Labs.
Gordon Enterprises
International Dev. Co.
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Instrumaster Industries
Kenyon Instrument Co.
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Negus, T. S. & J. D.
Warren-Knight Co.

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PROTRACTORS, Transparent (See Drawing Instruments)

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Superior Meter Co.

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Electrosig Corp.
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Industrial Control
Lab-Tronics
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Scott, Hermon H.
Stoelting Co., C. H.
Yellow Springs Inst.

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Gotham Instrument
Green, Henry J.
H-B Inst. Co.
Henson Co., Fred C.
Hill & Co., E. V.
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Kahl Scientific Inst.
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Minneapolis-Honeywell
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PSYCHROMETERS, Recording (See Hygrometers, Recording)

PSYCHROMETERS, Sling
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Foxboro Co.
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Scientific Inst. Co.
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Radiation Inst. Dev. Lab
R-C Scientific Inst.
Rieker Inst. Co.
Rubicon Co.
Scientific Glass App.
Scott, Hermon H.
Taylor & Co., W. A.

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Burroughs Corp.
Computer Insts. Corp.
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Magnetic Research
Manson Labs.
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Polyphase Instrument Co.
Radex Corp.
Radiation Counter Labs.
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Atlantic Transformer Co.
Berkshire Labs.
Calif. Magnetic Control
Communication Access.
Del Electronics Co.
Detectolab, Inc.
Electrical Facilities
ESC-Corporation
Freed Transformer Co.
Gudeman Co.
Hycor Company
Keystone Products Co.
Lectronic Research Labs.
Magnetic Inst.
Magnetic Research
Microtran Co.
PCA Electronics, Inc.
Polyphase Instrument Co.
Raytheon Mfg. Co.
Sprague Electric
Sterling Transformer
Technitrol Engng Co.
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Texas Instruments
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Distillation Prods., Inc.
Eclipse-Pioneer Div.
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Optical Film Eng'ng.
Phipps & Bird
Phoenix Prec. Inst.
Precision Scientific
Process & Instruments
Radiation Counter Labs.
Refinery Supply Co.
Scientific Glass App.
Sterling Eng. Co.
Stoelting Co., C. H.
Stokes Machine Co.
Todd Scientific
Uehling Inst. Co.
Universal X-Ray Prods.
Vacuum Tube
Welch Scientific
Whittington Pump

PUMPS, Hydraulic Control
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American Inst. Co.
Askania Regulator
Autoclave Engrs.
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Bendix Aviation
Brown & Sharpe
Denison Engineering
Dusenbury Co.
Eastern Industries, Inc.
Eclipse-Pioneer Div.
Ingersoll-Rand
Lapp Insulator
Lear, Inc.
Ledeen Mfg. Co.
Logeman, C. W.
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Pacific Div.
Pesco Products
Precision Scientific
Shallcross Controls
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Sundstrand Machine Tool
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PUMPS, Laboratory High Pressure (25,000 PSI)
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Autoclave Engineers
Central Scientific
Hills-McCanna
Lapp Insulator
Ledeen Mfg. Co.
Logeman, C. W.
Milton Roy Co.
Pressure Products
Proportioneers Inc.
Ruska Inst. Corp.
Specialties Inc.
Welch Scientific

PUMPS, Metering and Proportioning
American Instrument
Autoclave Engrs.
Baltimore Biological Lab.
Bowser, Inc.
Central Scientific
Gelber Co., Samual S.
Hills-McCanna
Ingersoll-Rand
Lapp Insulator
Logeman, C. W.
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Modern Metalcraft
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Neptune Pump
Phipps & Bird
Pressure Products
Process & Instruments
Proportioneers Inc.
Robinson & Co., E. E.
Roots-Connersville
Ruska Inst. Corp.
Shallcross Controls
Smith Precision Prods.
Wallace & Tierman
Whitey Tool & Die

PUMPS, Vacuum
Allis-Chalmers Mfg. Co.
Chicago Apparatus
Consolidated Vacuum
Daigger & Co.
Eitel-McCullough, Inc.
Fisher Scientific
Gast Mfg. Corp.
General Laboratory
High Vacuum Equipment
Lear, Inc.
Leiman Brothers.
Penna. Pump & Compressor
Phoenix Precision Inst.
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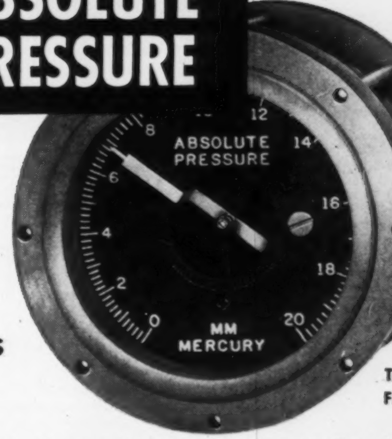

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A-105

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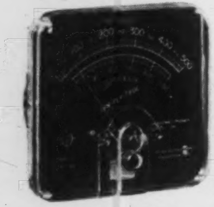
Pyrometers—Accuracy: 2%



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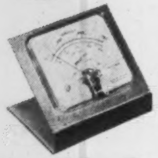
Medium resistance pyrometers (4 ohms per millivolt). Automatic, bimetal cold junction correction. Compensated for copper error. Furnished with adjusting resistor to take thermocouples up to external resistance of 10 ohms. Higher external resistance can be accommodated for some ranges. White face or black face dials. Ranges from —400 to +3000°F.

Ruggedized Pyrometers

Pyrometers can be furnished with shock-mounted movements in sealed cases.



Stand-mounted Pyrometer Model C

for bench-type heat observations.

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Portable Pyrometer Model B

Prices: $28.20 to $51.45.

Oak case-mounted pyrometer with 5′ lead. Permits spot checks without requiring a permanent installation.

ASSEMBLY PRODUCTS, INC.
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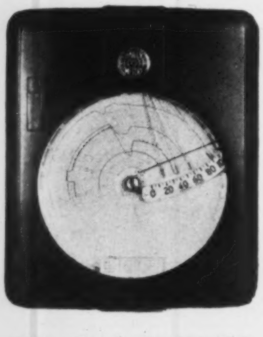
For more information circle **289** on inquiry card.



BAILEY

Electronic Pyrometer

- This indicating, recording and controlling Bailey d-c PYROTRON is a self balancing potentiometer which records one to four temperatures continuously on a 12″ circular chart. It may be furnished with pneumatic or electric control.

A thermocouple or a radiation unit is the temperature sensitive element.

Minimum maintenance is insured by elimination of galvanometers, millivolt meters, batteries and standard cells. A reversible electric motor, under electronic control, balances the potentiometer circuit and drives indicating, recording, and controlling features.

Bailey PYROTRON Recorder-Controllers are made up of interchangeable assemblies, standardized so that only a few spare parts need be carried in stock for many instruments.

For detailed information write for Product Specification E12-5.

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Bailey Meter Company Ltd., Montreal, Canada

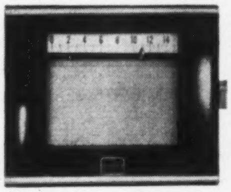
For more information circle **290** on inquiry card.

Pyrometers, Automatic Controllers, Indicators, Recorders

The Bristol line of Pyrometers includes electronic potentiometer, millivoltmeter, thermocouple, and radiation types in indicating, single-pen, two-pen, and multiple record (up to 24) models.

Strip-and round-chart recorders—Automatic Controllers are available with any of the following types of control: electric, electronic, or air-operated with all types of control actions and as program controllers.

Write for Bulletins P1260, P1245, P1242, P1244, PB1237, and P1238.



Bristol Dynamaster ® Electronic Potentiometer

BRISTOL COMPANY
112 Bristol Rd., Waterbury 20, Conn.

For more information circle **291** on inquiry card.

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Vacuum Tube Prod.
Vanton Pump & Equip.
Will Corp.
Worthington Corp.

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Winslow Co.

PYROMETER TUBES
(See Tubes, Pyrometer)

PYROMETERS, Electrical Resistance

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GE Apparatus Sales
Gilmore Industries
Gordon Co., Claud S.
Gray Instrument
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Phen-Trols, Inc.
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Roller-Smith Co.
Rubicon Co.
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Servo Corp.
Shallcross Mfg.
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Welch Scientific
West. Corp.
West Instrument
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Wheelco iv.
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Ferner Co.
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Huppert Co.
Lewis Engineering
Partlow Corp.
Pyrometer Inst. Co.
Thwing Albert Inst. Co.
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Burling Inst. Co.
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Fielden Insts.
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Gilmore Industries
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Elematic Equip. Corp.
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Fielden Instrument
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Gilmore Industries, Inc.
Gordon Co., Claud S.
Gray Instrument
Hagan Corp.
Herman, Victor George
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Ill. Testing Labs.
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Richards Co.
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West Corp.
West Instruments
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Dietert Co.
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Helio Instrument
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Leeds & Northrup Co.
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Minneapolis-Honeywell
Pacific Transducer
Pyrometer Inst. Co.
Thwing-Albert Inst.

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Cambridge Inst. Co.
Cybertronic Corp.
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Electro-Tech Equip.
Elematic Equip. Corp.
Engelhard, Chas.
Ferner Co.
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Gray Instrument
Howell Instrument
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Leeds & Northrup Co.
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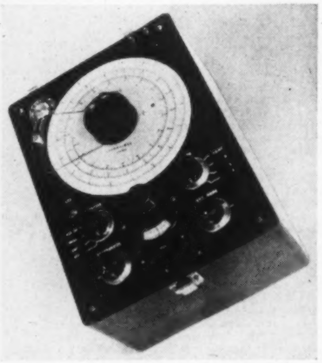
Roller-Smith
Rubicon Co.
Tamms Silica Co.



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GE Apparatus Sales
Gordon Co., Claud S.
Gray Instrument
Herman, Victor George
Howell Instrument
Illinois Testing Labs.
Leeds & Northrup
Lewis Engg. Co.
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Manning, Maxwell & Moore
Minneapolis-Honeywell
Pyrometer Inst. Co.
Robertshaw-Fulton Co.
Rubicon Co.
Technique Associates, Inc.
Thermo-Electric Co.
Thwing-Albert Instrument
West Instrument
Weston Elec. Inst.
Wheelco Div.

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Blue M Electric
Bristol Co.
Cambridge Inst. Co.
Carlingo Commodities
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Fielden Instrument
Foxboro Co.
General Elec. Co.
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Herman, Victor George
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Servo Corp.
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West Instrument
Wheelco Div.

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Cambridge Inst. Co.
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Hagan Corp.
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Minneapolis-Honeywell
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Thwing-Albert Instrument
West Instrument
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Ferner Co.
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Foxboro Co.
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Gray Instrument
Hagan Corp.
Hanson-Gorrill-Brian
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Instrument Lab.
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Manning, Maxwell & Moore
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West Corp.
West Instrument
Weston Elec. Inst.
Wheelco Div.
Winslow Co.

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Elematic Equip. Corp.
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Physics Research
Precision Thermometer
Pyrometer Inst.
Revere Corp.
Richards Co., Arklay S.
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Roller-Smith
Rubicon Co.
Scientific Inst. Co.
Sensitive Research Inst.
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Wabash Metal Products
Welch Scientific
West Corp.
West Instrument
Weston Elec. Inst.
Weksler Thermometer
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Fielden Instrument
Foxboro Co.
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Gilmore Industries
Gordon Co., Claud S.
Hagan Corp.
Hanson-Gorrill-Brian
Ill. Testing Labs.
Instrument Dev. Labs.
Kybernetes Corp.
Larson Instrument
Leeds & Northrup Co.
Lewis Engineering
Loudon Div., Land-Air
Manning, Maxwell & Moore
Mason-Neilan Regulator
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Partlow Corp.
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Richards Co., Arklay S.
Robertshaw-Fulton Co.
Servo Corp.
Technical Equipment
Thermo-Electric
Thwing-Albert Instrument
West Corp.
West Instrument
Weston Elec. Inst.
Wheelco Div.

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Barber-Colman
Bristol Co.
Cambridge Inst. Co.
Cybertronic Corp.
Elematic Equip. Corp.
Engelhard, Chas.
Feiler Engineering
Ferner Co.
Foxboro Co.
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Gordon Co., Claud S.
Gray Instrument
Hagan Corp.
Huppert Co., K. H.
Illinois Testing Labs.
Instrument Lab.
J-B-T Instruments
Laboratory Specialties
Lewis Engg. Co.
Physics Research
Precision Thermometer
Pyrometer Inst.
Pyrometer Service
Revere Corp.
Robertshaw-Fulton Co.
Simpson Electric
Tamms Silica Co.
Testing Machines Inc.
Thermo-Electric Co.
Thwing-Albert Instrument
Welch Scientific
West Instrument
Weston Elec. Inst.
Wheelco Div.
Winslow Co.

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(See Cones, Pyrometric)

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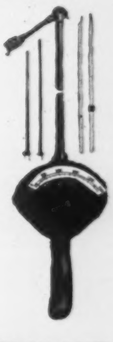
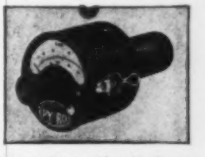


PYRO
Radiation
Pyrometer



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Forro Scientific
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Measurement Corp.
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Millen Mfg.
Miller Mfg. Co.
Millivac Insts.
National Co.
New London Instrument
Potter Instrument
Premier Crystal Labs.
Rawson Electrical Inst.
RCA Div.
Roller-Smith
Sensitive Research Inst.
Servo Corp. of America
Simpson Elec. Co.
Sherron Metallic
Sperry Gyroscope Co.
Stoddart Aircraft Radio
Sylvania Electric Prod.
Teletronics Lab.
Triplett Electrical Inst.
Virginia Electronics
Walkirt Co.
Westinghouse Co.
Weston Elec. Inst. Corp.

RADIO FREQUENCY OSCILLATORS (See Oscillators, Radio Frequency)

RADIO-MICROMETERS (See Micrometers, Radio)

RADIO REMOTE CONTROL SYSTEMS (See Controllers Automatic, Radio Remote)

RADIO SET ANALYZERS (See Analyzers, Radio Set)

RADIOSONDES
ACF Electronics
Alden Products
Applied Science Corp.
Bendix Aviation
Cardwell Mfg. Co.
Friez Instrument Div.
General Elec. Co.
Kollsman Instrument
Pacific Div.
Reiner Electronics
Serdex, Inc.
Shasta Div.
Tenney Engineering
Victory Eng'ng Corp.
Wallace & Tiernan

RADIO TEST PANELS (See Panels, Radio Test)

RADIO TUBE CHECKERS (See Analyzers, Radio Set)

RADIUM DETECTORS see Detectors, Radioactivity

RADIUM HANDLING EQUIPMENT
Anton Electronic Labs.
Atomlab Inc.
Bar-Ray Products
Canadian Radium
Corbett Science Labs., F. W.
El-Tronics Inc.
Instruments, Inc.
MRD Instrument
Nuclear Chicago
Radiation Counter Labs.
R-C Scientific
Tracerlab, Inc.
United Engineers
Universal Atomic
Western Radiation Lab.

RAIN GAGES
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Bendix Aviation
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Friez Instrument Div.
Green, Henry J.
Gurley, W. & L. E.
Henson Co., Fred C.
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Instruments, Inc.
Keuffel & Esser Co.
Leupold & Stevens
Micro Instrument Co.
North American Inst.
Pacific Scientific
Precision Thermometer
Stewart, M. C.
Taylor Inst. Cos.
Virginia Electronics
Warren-Knight Co.
White Co., Inc.

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Bendix Aviation
Berkeley Scientific
Friez Instrument Div.
Gorrell & Gorrell
Green, Henry J.
Instruments Corp.
Instruments, Inc.
Leupold & Stevens
North American Insts.
Taylor Inst. Cos.
Virginia Electronics

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American Electroneering
Bauch & Lomb
Bendix Aviation
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Daystrom Inst.
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Gaertner Scientific Corp.
Gurley, W. & L. E.
Hastings Inst. Co.
International Dev. Co.
Keuffel & Esser Co.
Kollmorgen Optical Co.
Leitz, Inc.
Meyer & Co., Hugo
Norden-Ketay Corp.
Penn Optical & Inst.
Precision Thermometer
RCA Div.
Servo Corp. of America
Stafford Co.
Testa Mfg. Co.
Topp Industries
White Co.
Wild Heerbrugg

RANGE POLES (See Surveying Instruments)

REACTANCE METERS
Boonton Radio Corp.
Clarke Inst. Corp.

INTERNATIONAL

HIGH VOLTAGE Selenium Rectifier CARTRIDGES

FERRULE TERMINAL • phenolic tubing

the WIDEST RANGE
in the INDUSTRY

STUD TERMINAL • phenolic tubing

SPECIFICATIONS

DC output voltages from 20 to 20,000 volts and up. DC output current, half wave, from .2 MA to 195 MA. Cell diameters from 1/16" to 1" Cartridge lengths from 1/2" to 12"

PIGTAIL TERMINAL • phenolic tubing

APPLICATIONS

Computors, geiger counters, guided missiles, radar circuits, oscilloscopes
Hermetically sealed units available for airborne applications.

Write for Bulletin H-2.

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NEW YORK: 501 MADISON AVENUE • PLaza 3-4942
CHICAGO: 205 W. WACKER DR. • FRanklin 2-3889

For more information circle **296** on inquiry card.

Electro Products Lab.
Federal Telephone
Freed Transformer
General Elec. Co.
General Radio Co.
Jackson Co., Byron
Marconi Insts.
Premier Research Labs.
RCA Div.
Rubicon Co.
Sensitive Research Inst.
Sierra Electronic
Technology Instruments

REACTIVE VOLT-AMPERE METRES, See Volt-ampere Meters, Reactive

READING LENSES, Thermometer & Burette (See Lenses, Reading)

RECORDER, Magnetic Tape
Ampex Electric
Brush Electronics
Fairchild Recording
Magnecord, Inc.
Presto Recording
R.C.A.

RECORDERS (See object of measurement and control

RECORDING PAPERS
Hathaway nstrument
Hogan Labs.
Leed & Northrup Co.
Times Facsimile Corp.

RECORDERS, Potentiometer (See Potentiometers)

RECTICLES
Hurd, Harold H.

RECTIFIERS, Dry Disk
American Rectifier
Automatic Elec. Chicago
Bart-Messing
Bogue Elec. Mfg.
Bradley Labs.
Conant Laboratories
Control Corp.
Dearborn Scientific
De Jur-Amsco Corp.
Elec. Facilities, Inc.
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Fansteel Metallurgical Corp.
Federal Telephone
GE Apparatus Sales
Germanium Prods.
Hansen Co., Wm.
Inet, Inc.
International Rectifier Corp.
International Resistance
International Std. Trading
La Marche
Leland, Inc., G. H.
Mallory & Co.
McColpin-Christie
Opad Electric
Perkin Engineering
Physics Research
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Schauer Mfg. Co.
Shasta Div.
Standard Arcturus Corp.
Sorenson & Co.
Standard Elec. Time
Standard Transformer
Sylvania Elec. Prod.
Texas Instruments
Union Switch
Vickers Electric
Westinghouse Elec.

RECTIFIERS, High-Vacuum
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Eitel-McCullough Inc.
GE Apparatus Sales
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Mallory & Co.
Opad Electric Co.
Philco Corp.
Vacuum Tube Prod.

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Continental Electric
Eitel McCullough
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Electrosig Corp.
Federal Telephone
GE Apparatus Sales
International Std. Trading
Opad Electric
Perkin Engineering
Raytheon Mfg.
RCA Tube
Richardson-Allen
Sylvania Elec.Prod.
Tube Div., GE

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Bogue Elec. Mfg.
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Karl-Douglas Assoc.
Lambda Electronics
Magnetic Instrument
Magnetic Research
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McColpin-Christie
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Schauer Mfg. Co.
Shasta Div.
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TAB
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Vickers Electric
Westinghouse Elec.

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REFLECTIONMETERS (See Reflectometer)

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Hewlett-Packard
Instrument Dev. Labs.
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Mann Co., Wm. I
Pfaltz & Bauer
Phoenix Precision Insts.
Photovolt Corp.
Sierra Electronic
Testing Machines Inc.
Welch Scientific
Zeiss, Inc., Carl

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E & W Optical
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Pancro Mirrors
Penn Optical & Inst.
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Tinsley Labs.
Unertl Optical Co.
Zenith Optical

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Bray Optical
Buchele, W.
Cal-Astro Optical
Canoga Corp.
Clark & Sons
Commercial Optical
Curtiss Labs.
Davidson Mfg. Co.
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E & W Optical
Eclipse-Pioneer
Fecker, J. W.
Fish-Schurman Co.
Gaertner Scientific
Georator Corp.
Gordon Enterprises
Hayward Scientific Glass
Helio Instrument
Henson Co., Fred C.
Herron Optical
Howland Optical Co.
Houston Technical Labs.
International Dev. Co.
Laboratory Optical
Lancaster Lens
Mann Co., W. I.
Optron Laboratory
Pacific Optical
Pancro Mirrors
Penn Optical & Inst.
Perkin-Elmer Corp.
Simpson Optical Mfg.
Tinsley Labs.
Topp Industries
Unertl Optical Co.
Zenith Optical

REFLECTORS, First Surface
Acme Scientific
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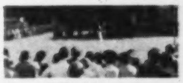
Baird Associates
Bausch & Lomb Optical
Bray Optical Co.
Buchele, W.
Cal-Astro Optical
Clark & Sons
Commercial Optical
Crystal Research Labs.
Curtiss Labs.
Davidson Mfg. Co.
Dearborn Scientific
Engis Equipment
E & S Optical
E & W Optical
Fecker, J. W.
Fish-Schurman Co.
Gaertner Scientific
Georator Corp.
Gordon Enterprises
Hayward Scientific Glass
Helio Instrument
Henson Co., Fred C.
Herron Optical
Houston Technical Labs.
Howland Optical Co.

Continuous, direct graphic recording now accomplished by Alfax Paper where previously photography and secondary means seemed necessary.

New Alfax Paper—"electricity is the ink" makes possible simple, rugged recorders that operate unattended to get great amounts of related information recorded compactly with great accuracies. Using the electronic signal outputs of radar, sonar, on-off pulses and facsimile transmission to record directly on Alfax, you can get over 17 tone shades instantly responsive to amount of current passage for direct, graphic recordings at very slow (inches/hour) and fast (more than 400"/sec.) writing speeds without the need of photography or secondary means.

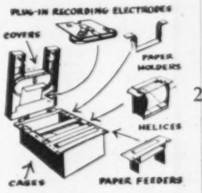
Helix replaces cathode ray screen

Telegraph Test Record


TV pictures without photography

Write for new booklet "Recording with Alfax" to Alfax Paper and Engineering Co., Westboro 3, Mass.

"Flying Spot" recording simplified by new Alden adjusterless helix recorder components.



go together easily

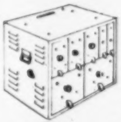
2" to 19" paper widths

in sizes for every need

Alden adjusterless recorder techniques built into these recorders enable you to explore the new horizons opened up by Alfax, while insuring you fullest utilization of Alfax characteristics.

Write Alden Electronic and Impulse Recording Equipment Co., Westboro 3, Mass., for "New Horizons in Recording".

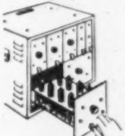
Electronic circuitry design and construction simplified by Alden mechanical components to mount, house, fasten and connect circuitry so that . . .



1

Circuitry subdivides function by function into plug-in, vertical planes of circuitry.

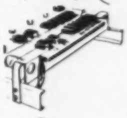
ALDEN TERMINAL CARD SYSTEM



2

Circuitry housed in standard, plug-in packages that provide 30 sec. replacement servicing.

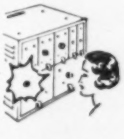
ALDEN BASIC CHASSIS & PLUG-IN PACKAGES



3

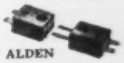
All plug-in unit wiring organized as accessible, coded, "point of check" connections so layman can understand.

ALDEN "TELL TALES"



4

Tiny front panel "tell tales" for plug-in units spot trouble instantly.


ALDEN BACK CONNECTORS

Write Alden Products Co., Brockton 641, Mass. for Alden Handbook "Ideas, Techniques, Designs".

For more information circle **297** on inquiry card.

FOR
MAXIMUM
SENSITIVITY. .

CONOFLOW
small volume
AIR PRESSURE REGULATORS

The Conoflow Model H-10 Precision Regulator is an inexpensive, reducing-relief type regulator ideal for small volume or "dead-end" service. It is capable of maintaining set pressures to within .005 psi regardless of vibration or upstream pressure variations. Dependability of the Cono Regulator is attested to by its use as original equipment by many nationally known manufacturers. Streamlined design of all brass and stainless steel construction. Available for flush panel or line mounting in ¼" pipe size. Spring ranges from 0-5 to 0-125 psi.

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CC-504

Cono Controls®

CONOFLOW CORPORATION
FOREMOST MANUFACTURERS OF FINAL CONTROL ELEMENTS
2100 ARCH STREET, PHILADELPHIA 3, PA.

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Testa Mfg. Co.
Tinsley Labs.
Topp Industries
Unertl Optical Co.
Webber Gage
Zenith Optical

REFLECTORS, Heat Resisting
American Lens
Bausch & Lomb Optical
Beseler Co., Charles
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E & S Optical
Fish-Schurman Co.
Gordon Enterprises
Helio Instrument
Houston Technical Labs.
International Dev. Co.
Laboratory Optical
Lancaster Lens
Mann Co., W. I.
Optron Laboratory
Perkin-Elmer Corp.
Simpson Optical Mfg.
Zenith Optical

REFLECTORS, Parabolic
Airborne Instruments
American Instrument
American Lens
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Bausch & Lomb Optical
Bray Optical
Buchele, W.
Canoga Corp.
Clark & Sons
Davidson Mfg. Co.
E & S Optical
E & W Optical
Erie Resistor
Farrand Optical
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Gaertner Scientific
Gordon Enterprises
Helio Instrument
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International Dev. Co.
Kearfott Co.
Laboratory Optical
Lancaster Lens
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Optron Laboratory
Penn Optical & Inst.
Perkin-Elmer Corp.
Simpson Optical Mfg.
Tinsley Labs.
Unertl Optical Co.
Weber Bros. Metal Works
Zenith Optical

REFLECTORS, Spherical
American Lens
Baird Associates
Bausch & Lomb Optical
Beseler Co., Charles
Bray Optical
Buchele, W.
Cal-Astro Optical
Canoga Corp.
Commercial Optical
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Davidson Mfg. Co.
E & S Optical
Farrand Optical
Fecker, J. W.
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Gordon Enterprises
Hayward Scientific Glass
Helio Instrument
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Howland Optical Co.
Houston Technical Labs.
International Dev. Co.
Laboratory Optical
Lancaster Lens
Mann Co., W. I.
Optron Laboratory
Pacific Optical
Penn Optical & Inst.
Perkin-Elmer Corp.
Simpson Optical Mfg.
Testa Mfg. Co.
Tinsley Labs.
Unertl Optical Co.
Zenith Optical

REFLECTORS, Stellite
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Bausch & Lomb Optical
E & W Optical
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Georator Corp.
Gordon Enterprises
Helio Instrument
International Dev. Co.
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Mann Co., W. I.
Optron Lab.
Penn Optical & Inst.
Perkin-Elmer Corp.
Zenith Optical

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Bushnell Optical
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Gaertner Scientific
Helio Instrument
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Photovolt Corp.
Polarizing Instrument
Precision Scientific
Process & Instruments
Zeiss, Inc., Carl

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Burrell Corp.
Coors Porcelain Co.
International Dev. Co.
Minneapolis-Honeywell
Thermal American Fused
Wheatstone Corp.

REGISTERS, Magnetic Shift
Burroughs Corp.
Computer Control Co.
Epsco, Ir
Sprague Electric

REGULATORS, AUTOMATIC (See also Controllers, Automatic; and object of measurement and control)

REGULATORS, AUTOMATIC, Air
Acme Regulator Co.
Air Associates
AiResearch Mfg. Co.
American Meter Co.
Arca Regulators, Inc.
Askania Regulator Co.
Assoc. Valve & Engrg.
Atlas Valve Co.
Automatic Control Co.
Automatic Temp. Control
Bailey Meter Co.
Bastian-Blessing Co.
Black, Sivalls & Bryson
Block Mfg. Co.
Boekel & Co.
Boylston Co.
Bristol Co.
Brooke Eng. Co.
Cash Co.
Cash Valve Mfg. Corp.
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Conoflow Corp.
Continental Foundry
Cutler-Hammer, Inc.
Davis Reg. Co.
Detroit Lubricator
Eclipse Fuel Engr.
Engelhard, Inc., Charles
Farris Engineering
Fischer & Porter
Fisher Governor Co.
Foster Engg. Co.
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Gas Appliance Spec.
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General Regulator
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Hammel-Dahl Co.
Hays Corp.
H-B Instrument
Hoke, Inc.
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Industrial Inst.
Johnson Service Co.
Jordan Regulator
Kaye & MacDonald
Kendall Controls Corp.
Kieley & Mueller
Klipfel Div.
Kollsman Instrument
Lammert & Mann Co.
Leslie Co.
Linde Air Products Co.
Manning, Maxwell & Moore
Marsh Corp.
Mason Neilan Regulator
McAlear Mfg.
Mercoid Corp.
Mercon Regulator Co.
Minneapolis-Honeywell
Moore Products
Natural Gas Equipment
C. A. Norgren Co.
North American Mfg.
Northern Equip. Co.
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Penn Industrial Inst.
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Republic Flow Meters
Research Controls
Reynolds Gas Regulator
Sarco Corp.
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Schutte & Koerting
Schwien Engr.
Seely Inst. Co.
Selas Corp. of America
Shallcross Controls
Sprague Meter Co.
Soreng Corp.
Spence Engineering Co.
Swartwout Co.
Taylor Inst. Cos.
Trerice Co.
United Electric
Weston Elec. Inst.
White-Rodgers Electric

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Bristol Co.
Foster Engineering
Foxboro Co.
General Controls
Hagan Corp.
Hammel-Dahl Co.
Ideal Lab. Tool
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Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg.
Natural Gas Equipment
Penberthy Injector Co.
Powers Regulator Co.
Shallcross Controls
Taylor Inst. Cos.
United Electric
Vapor Recovery Systems

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Bristol Co.
Brooke Eng. Co.
Campbell Co., J. A.
Cash Co., A. W.
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Century Inst. Co.
Douglass Automatic
Eclipse Fuel Engr.
Fisher Governor Co.
Foster Engg. Co.
Foxboro Co.
Fuel Watchman
General Controls
General Regulator Corp.
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Henszey Co.
Jordan Regulator
Kaye & MacDonald
Kieley & Mueller
Klipfel Valves
Larson Instrument
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Leslie Co.
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Mason-Neilan Regulator
McAlear Mfg. Co.
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Natural Gas Equipment
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Penn Ind. Inst. Div.
Reliance Inst. Mfg.
Republic Flow Meters
Research Controls
Reynolds Gas Regulator
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Shallcross Controls
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Swartwout Co.
Taylor Inst. Cos.
Weston Elec. Inst.
White Rodgers Elec.

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Fischer & Porter
Fisher Governor Co.
Foster Engineering
Foxboro Co.
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General Regulator
Grove Valve & Regulator
Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Hoke, Inc.
Industrial Inst.
Kaye & MacDonald
Kieley & Mueller
Leslie Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg. Co.
Mercon Regulator Co.
Moore Products
Natural Gas Equipment
C. A. Norgren Co.
Republic Flow Meters
Research Controls
Reynolds Gas Regulator
Robertshaw Thermostat
Schade Valve Mfg. Co.
Selas Corp. of America
Shallcross Controls
Taylor Inst. Cos.
United Electric
Vapor Recovery Systems
Weston Elec. Inst.

REGULATORS, AUTOMATIC, Condensation (See Controllers, Automatic, Condensation)

REGULATORS, AUTOMATIC, Consistency (Paper & Pulp) (See Controllers, Automatic, Consistency)

REGULATORS, AUTOMATIC, Current
Abrams Instrument
Advanced Electronics
Amperite Co.
Amplifier Co.
Askania Regulator
Assembly Products
Automatic Elec.
Automatic Temp. Control
Avion Div.
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Beck Bros.
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Betts & Betts
Bogue Elec. Mfg.
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Burlington Inst. Corp.
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Cook Electric
Cutler-Hammer, Inc.
Devtronics Inc.
DoAll Co.
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Donner Scientific
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Electrosig Corp.
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Engineering Magnetics
Federal Telephone
Fielden Instruments
Furst Electronics
General Controls
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General Magnetics
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Hevi-Duty Electric
Inet Inc.
Karl-Douglas Assoc.
Kepco Labs.
Lewis & Co., J. B.
Lindberg Air
Mag Electric Prod.
Magnetic Amplifiers
Magnetic Instrument
Manning, Maxwell & Moore
Nankervis Co., G. L.
Ohmite Mfg.
Peschel Electronics
Precise Measurements
Raytheon Mfg. Co.
Richardson-Allen
Rockwell Engr.
Roller-Smith
Rubicon Co.
Shallcross Controls
Sherron Metallic
Sola Electric Co.
Sorensen & Co.
Square D Co.
Streeter-Amet Co.
Teletronics Lab.
Thermo Electric Mfg.
Thordarson-Meissner
United Transformer
Victoreen Inst. Co.
Westinghouse Elec.
Wilson & Co., G. C.

REGULATORS, AUTOMATIC Damper (See Controllers, Automatic, Damper)

REGULATORS, AUTOMATIC, District (See Governers, District)

REGULATORS, AUTOMATIC, Draft (See Controllers, Automatic Draft)

REGULATORS, AUTOMATIC, Drying Chamber
Automatic Temp. Control
Bailey Meter Co.
Barber-Colman
Bristol Co.
Foxboro Co.
Fulton-Sylphon Div.
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Kahn & Co.
Lennard & Co., P. M.
Powers Regulator Co.
Sarco Corp.
Trerice Co.
United Elec. Controls

REGULATORS, AUTOMATIC, Feed Water (see Controllers, Automatic, Feed Water)

REGULATORS, AUTOMATIC, Flow (See Controllers, Automatic Flow)

REGULATORS, AUTOMATIC, Flow Proportioning (See Controllers, Automatic, Flow Proportioning)

REGULATORS, AUTOMATIC, Fluid Proportioning (See Controllers, Automatic, Fluid Proportioning)

REGULATORS, AUTOMATIC, Frequency
Allis-Chalmers
Avion Div.
Bendix Red Bank Div.
Berkeley Scientific
Bogue Electric Mfg.
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Doelcam Div.
Eclipse-Pioneer
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GE Apparatus Sales
General Magnetics, Inc.
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Karl-Douglas Assoc.
Kearfott Co.
Kellogg Switchboard
Leeds & Northrup
MagElectric Prod.
Magnetic Amplifiers
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Metrotype Corp.
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Varo Mfg.
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REGULATORS, AUTOMATIC, Furnace (See Controllers, Automatic, Furnace)

REGULATORS, AUTOMATIC, Gas (See Regulators, Automatic, Air)

REGULATORS, AUTOMATIC, Humidity (See Controllers, Automatic, Humidity)

REGULATORS, AUTOMATIC, Liquid Level (See Controllers, Automatic, Liquid Level)

REGULATORS, AUTOMATIC, Load
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Baldwin-Lima-Hamilton
Bogue Elec. Mfg.
Bristol Co.
Burlington Inst. Co.
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Control Engg. Co.
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(3) Bailey Three-Element feed water control is recommended for high capacity low water storage boilers operating at high pressures or for boilers operating at medium pressures with violent load fluctuations. This system is based on actual measurement of water flow to the boiler, steam flow from the boiler and water level within the boiler, and is adjusted primarily to control the rate of water flow to the boiler so that it equals the rate of steam flow from the boiler.

For detailed information consult Sweet's Engineering Catalogs or request bulletin ● No. 105.

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Magnetic Instrument
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Norcross Corp.
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Shallcross Controls
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Square D Co.
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Westinghouse Elec.
Wilson & Co., G. C.

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Brooks Rotameter
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Fischer & Porter
Fisher Governor
Foster Engg. Co.
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Hagan Corp.
Hammel-Dahl Co.
Hays Corp.
Jordan Regulator
Lammert & Mann Co.
Leslie Co.
Lumenite Electronic
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Pen Indus. Inst. Co.
Reliance Inst. Mfg. Co.
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Spence Engineering Co.
Soreng Products
Taylor Inst. Cos.
United Electric
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Industrial Test Equip.
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Metrotype Corp.
Robinette Co.
Sangamo Electric
Shallcross Controls
Sorensen & Co.
Westinghouse Elec.

REGULATORS, AUTOMATIC, Pressure (See Controllers, Automatic, Pressure)

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Atlas Valve Co.
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Automatic Temp. Control
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Boylston Co.
Bristol Co.
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Fischer & Porter
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Fulton Sylphon Div.
Furnas Electric Co.
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Henszey Co.
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Kieley & Mueller
Klipfel Div.
Jordan Regulator Corp.
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Lapp Insulator
Leslie Co.
Lumenite Electronic
Magnetic Instrument
Mason-Neilan Regulator
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Swartwout Co.
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Warrick, Chas. F.
Water Level Controls Co.
Weston Elec. Inst.
Yellow Spring Instrument

REGULATORS, AUTOMATIC, Refrigeration (See Controllers, Automatic, Refrigeration)

REGULATORS, AUTOMATIC, RKVA
Allis-Chalmers Mfg. Co.
GE Apparatus Sales
Leeds & Northrup
Magnetic Instrument
Sangamo Electric
Thordarson Elec. Mfg.
Westinghouse Elec.

REGULATORS, AUTOMATIC, Safety Fuel Shut-Off (See Valves, Automatic, Safety Fuel)

REGULATORS, AUTOMATIC, Steam Pressure (See Controllers, Automatic Pressure)

REGULATORS, AUTOMATIC, Synchronizing
AiResearch Mfg.
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Counter & Control Corp.
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Servospeed Div.
Shallcross Controls
Westinghouse Elec.

REGULATORS, AUTOMATIC, Temperature (See Controllers, Automatic, Temperature)

REGULATORS, AUTOMATIC, Time (See Controllers, Automatic, Time)

REGULATORS, AUTOMATIC, Torque
Askania Regulator
Automatic Temp. Control
Cal-Tronics Corp.
Control Engg. Co.
Cutler-Hammer
Fielden Instrument
G. E. Apparatus Sales
Gilmore Industries
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Taylor Inst. Co.
Vectron, Inc.
Vickers Elec. Div.

REGULATORS, AUTOMATIC, Vacuum (See Controllers, Automatic, Pressure & Vacuum)

REGULATORS, AUTOMATIC, Viscosity (See Controllers, Automatic Viscosity)

REGULATORS, AUTOMATIC, Voltage
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Acme Electric
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American Transformer
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Amplifier Co.
Anton Electronic Labs.
Arga Div.
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Doelcam Div.
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Magnetic Instrument
Magnetic Research
Martin & Co.
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Wilson & Co., G. C.
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REGULATORS, AUTOMATIC, Water Pressure (See Controllers, Automatic, Pressure)

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Grove Valve & Regulator
Hoke, Inc.
Linde Air Products

REGULATORS, Current
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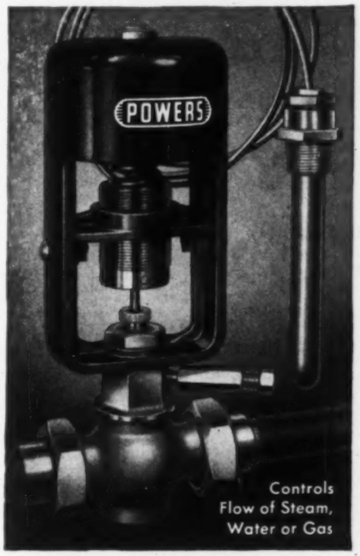

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Kinetic Instrument
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H-B Instrument
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Kurman Electric
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Edison, Inc., T. A.
Elgin-Neomatic, Inc.
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Leach Relay Co.
Magnecord Electric
Milwaukee Gas
Ohmite Mfg.
Paul & Stein
Phaostron Co.
Phillips Control
Pollak Corp.
Potter & Brumfield
Price Electric Corp.
Sigma Instruments
Square D Co.
Struthers-Dunn
Triad Transformer
Triplett Elec. Inst
U. S. Relay Co.
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

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Automatic Switch
Automatic Temp. Control
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Clare & Co.
Clark Controller Co.
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Cook Electric Co.
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Merciod Corp.
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Phaostron Co.
Philadelphia Scientific
Phillips Control
Pollack Corp.
Potter & Brumfield
Precision Scientific
Precision Therm.
Price Electric Corp.
Relay Service Co.
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Roller-Smith Co.
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Struthers-Dunn
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Triplett Elec. Inst.
Union Switch
U. S. Relay Co.
Ward Leonard Elec. Co.
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Struthers-Dunn
Triplett Elect. Inst.
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U. S. Relay Co.
Ward Leonard
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Weston Elec. Inst. Corp.

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Automatic Switch
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Essex Wire Corp.
GE Apparatus Sales
Guardian Electric
Hagan Corp.
Jaidinger Mfg. Co.
Leach Relay Co.
Sangamo Electric
Triad Transformer
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Allied Control Co.
American Electronic Labs.
American Inst. Co.
American Relay & Controls
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Assembly Products
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Automatic Elec. Mfg. Co.
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Branson Corp.
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Burroughs Corp.
Clare & Co.
Clark Controller Co.
Comar Electric Co.
Control Corp.
Control Engg. Co.
Cook Electric Co.
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Cutler-Hammer, Inc.
Deltronic Corp.
Doelcam Corp.
Dormitzer Elec. & Mfg.
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Edison, Inc., Thomas A.
Elgin National Watch
Elgin-Neomatic, Inc.
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Engineering Res. & Dev.
Essex Wire Corp.
Friez Instrument Div.
GE Apparatus Sales
G-M Labs.
Gorrell & Gorrell
Guardian Elec. Mfg. Co.
Hart Mfg. Co.
H-B Instrument
Hedin Tel Technical
Hetherington & Son
Hi-G, Inc.
Hufco Industries
Industrial Eng. Corp.
International Std. Trading
Jaidinger Mfg.Co.
Kellogg Switchboard
Kurman Electric
Leach Relay Co.
Mack Elec. Devices
Magnecord Electric
Magnetic Amplifiers
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Milwaukee Gas
Minneapolis-Honeywell
National Time & Signal
Ohmite Mfg.
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Perfex Corp.
Phaostron Co.
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Precision Scientific
Precision Therm. & Inst.
Price Electric Corp.
RCA Div.
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Sterling Eng'ng.
Stromberg Time Corp.
Struthers-Dunn
Tork Clock
Triad Transformer
Triplett Elec. Inst.
Union Switch
U. S. Relay Co.
Ward Leonard Elec. Co.
Warrick, Chas. F.
Westinghouse Elec.
Weston Elec. Inst. Corp
White-Rodgers Electric
Zenith Electric

RELAYS, Electronic

Advance Elec. & Relay Co.
Advanced Electronics
Allen-Bradley Co.
Allied Control Co.
American Electroneering
American Inst. Co.
Authorized Mfrs. Service
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Switch
Automatic Temp. Control
Beck Co.
Bell & Howell
Berkshire Laboratories
Burroughs Corp.
Central-Scientific
Chicago Surgical & Elec.
Clare & Co., C. P.
Clark Controller Co.
Coleman Electric
Computer Co. of America
Cook Electric
Cramer Co., Inc.
Cutler-Hammer, Inc.
Curtiss-Wright
Davis & Co., Inc., Dean
Deltron, Inc.
Detect-O-Ray Co.
De-Tec-Tronics Labs.
Devtronics, Inc.
Doelcam Div.
Dormitzer Elec. & Mfg.
Eclipse-Pioneer
Edison, Inc., Thomas A.
Electro-Medical Lab.
Electronic Control
Electronic Dev. Lab.
Electronics Corp. of America
Electro-Physics Co.
Elgin National Watch
Elgin-Neomatic, Inc.
El Mec Laboratories
Engrg. Research & Dev.
Erdco Engineering
Ess Instrument
Essex Wire Corp.
Farmer Electric Co.
Ferrara Inc.
Fisher-Pierce Co.
Fisher Scientific Co.
GE Apparatus Sales
Gorrell & Gorrell
Guardian Elec. Mfg.
Haledy Electronic Co.
Hart Mfg. Co.
Harvey Radio Labs.
H-B Instrument
Hi-G, Inc.
Industrial Electronic
International Instrument
International Std. Trading
Johanson Mfg. Co.
Jarco Services
Kahn & Co.
Kurman Electric
Kinetic Instrument
Labline, Inc.
La Pine & Co., A. S.
Leach Relay Co.
Lumenite Electronic
Lyman Electronic
Magnecord Electric
Milwaukee Gas
Minneapolis-Honeywell
Peschel Electronics
Phaostron Co.
Philadelphia Scientific
Phillips Control
Phipps & Bird
Potter & Brumfield
Precision Scientific
Price Electric Corp.
Process & Instruments
Raytheon Mfg.
RCA Div.
Rea Co., J. B.
Relay Service Co.
Robinette Co., W. C.
Rockwell Engr.
Sargent & Co., E.H.
Servo-Tek Products
Sigma Instruments
Simpson Electric
Signal Engr. & Mfg.
Square D Co.
Struthers-Dunn
Technical Equip. Co.
Televiso Products
Thordarson-Meissner
Triad Transformer
Union Switch
U. S. Relay Co.
Vacuum Tube
Varo Mfg. Co.
Virginia Electronics
Walkirt Co.
Weston Elec. Inst.
Wilkins-Anderson
Wilson & Co., G. C.
Worner Electronic

RELAYS, Frequency

Advance Elec. & Relay
Autocall Co.
Automatic Elec. Chicago
Automatic Switch Co.
Biddle Co.
Clare & Co., C. P.
Control Corp.
Cook Electric
Cutler-Hammer, Inc.
Eclipse-Pioneer
Eserline-Angus Co.
GE Apparatus Sales
Guardian Electric
G-V Controls
Hickok Electrical Inst.
James Vibrapower Co.
Kellogg Switch board
Leach Relay Co.
Lumenite Electronic
Phaostron Co.
Potter & Brumfield
Sigma Instruments
Stevens-Arnold Co.
Triad Transformer
U. S. Relay Co.
Varo Mfg. Co.
Wallace & Tiernan
Ward Leonard Electric Co.
Westinghouse Elec.

RELAYS, Galvanometer

Advance Elec. & Relay
Allied Control Co.
Assembly Products
Autocall Co.
Automatic Elec. Chicago
Automatic Temp. Control
Cutler-Hammer Inc.
Doelcam Div.
Eby, Inc., Hugh H.
Edison, Inc., Thomas A.
Esterline-Angus
Fielden Research
GE Apparatus Sales
Larson Instrument
Leach Relay Co.
Marion Elec. Inst.
Potter & Brumfield
Roller-Smith
Rubicon Co.
Triad Transformer
Weston Elec. Inst.

RELAYS, Heavy Duty

Adams & Westlake
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
American Inst. Co.
American Relay & Controls
Autocall Co.
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Switch Co.
Automatic Temp. Control
Clark Controller Co.
Comar Electric Co.
Cook Electric
Cutler-Hammer, Inc.
Ebert Electronics
Eclipse-Pioneer
Elgin-Neomatic Inc.
Esterline-Angus
GE Apparatus Sales
Guardian Elec. Mfg.
H-B Instrument
Hetherington & Son
Hi-B. Inc.
Jaidinger Mfg. Co.
Kurman Electric
Leach Relay Co.
Lumenite Electronic
Miller Co; Bertrand F.
Ohmite Mfg.
Phaostron Co.
Perfex Corp.
Philadelphia Scientific
Philadelphia Thermometer
Phillips Control
Potter & Brumfield
Price Electric Corp.
Signal Engr. & Mfg.
Square D Co.
Struthers-Dunn
Triad Transformer
U. S. Relay Co.
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Zenith Electric Co.

RELAYS, Instrument Controlled

Abrams Instrument
Adams & Westlake
Advance Elec. & Relay
Advanced Electronics
Allied Control Co.
American Inst. Co.
Assembly Products
Autocall Co.
Automatic Elec. Chicago
Automatic Elec.Mfg.
Automatic Switch Co.
Automatic Temp. Control
Bailey Meter Co.
Barber-Coleman
Beck Co.
Bristol Co.
Branson Corp.
Clare & Co.
Climax Div.
Cook Electric Co.
Cramer & Co., Inc.
Cutler-Hammer Inc.
Devtronics Inc.
Ebert Electronics
Eclipse-Pioneer
Edison Inc., Thomas A.
Electric Des. & Mfg.
Elgin National Watch
Elgin-Neomatic, Inc.
Fielden Research
Friez Instrument Div.
GE Apparatus Sales
Guardian Elec. Mfg. Co.
Haledy Electronic Co.
H-B Instrument
Hedin Tele Technical
Jaidinger Mfg. Co.
Kurman Electric
Leach Relay Co.
Mack Electric Devices
Magnecord Electric
Marion Elec. Inst.
Milwaukee Gas
Minneapolis-Honeywell
Moore Products
Perfex Corp.
Phaostron Co.
Philadelphia Scientific
Phila.Thermometer Co.
Phillips Controls
Pollak Corp.
Potter & Brumfield
Powers Regulator
Precision Scientific
Precision Therm.
Roller-Smith Co.
Scam Instrument
Sigma Instruments
Signal Engr. & Mfg.
Simpson Electric Co.
Struthers-Dunn
Technical Equip. Corp.
Tork Clock
Triad Transformer
Triplett Electrical Inst.
Union Switch
U. S. Relay Co.
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.

RELAYS, Light Sensitive (See Photoelectric below)

RELAYS, Magnetic (See Relays, Electromagnetic)

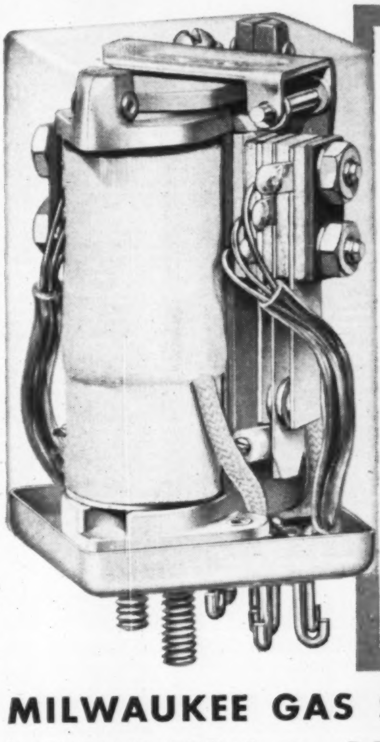
RELAYS, Mercury

Adams & Westlake
Allied Control Co.
American Inst. Co
Autocall Co.
Automatic Elec. Chicago
Automatic Temp. Control
Chatham Electronics
Clare & Co.
Continental Elec. Co.
Deltron, Inc.
Durakool, Inc.
Ebert Electronics
Electronic Apparatus
Guardian Electric
Haledy Electronics Co.
H-B Instrument
Mack Electric Devices
Mercury Contacts
Minneapolis-Honeywell
Philadelphia Scientific
Potter & Brumfield
Precision Scientific
Precision Therm.
Scientific Glass Apparatus
Struthers-Dunn
Weston Elec. Inst. Corp.

RELAYS, Mercury Tube

Adams & Westlake
Allied Control Co.
American Inst. Co.
Autocall Co.

RELAYS to your specifications



As an indication of what we can do for you, we can provide

WEIGHT—3 ounces.

SIZE—1″x1″x1$\frac{25}{32}$″ maximum.

CONTACTS—Coined silver, 3/16″ dia.

CONTACT ARRANGEMENTS—SPST, SPDT, DPST, DPDT.

CONTACT RATING—3 a., 28 v., d.c., @ 300,000 cycles.

DIELECTRIC STRENGTH—500 volts, a.c., between all contacts and all contacts and case.

COIL RESISTANCE—14,000 ohms maximum.

SENSITIVITY—9 mw. maximum.

Built to Military Specifications If Wanted

MILWAUKEE GAS SPECIALTY COMPANY
MILWAUKEE 1 • DEPT. ID • WISCONSIN

For more information circle 303 on inquiry card.

Mack
TOP LEVEL QUALITY

MERCURY PLUNGER RELAYS

- Only One Moving Part
- No Exposed Arc
- Silent
- U.L. Listed

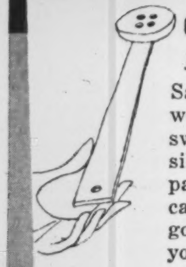
Ask for information on the new, silent, CA series for use where greater ruggedness is required. Other Mack relays are available normally closed or normally open for use with contact equipped instruments.

Mack ELECTRIC DEVICES, INC.
38 GLENSIDE AVE.
WYNCOTE, PA.

For more information circle 304 on inquiry card.

How to whip your relay problems!

Just call **ADVANCE...** *we're ready and willing to make the relays you need.*

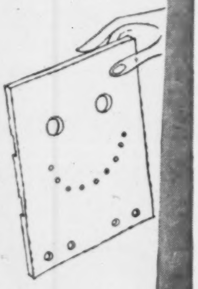


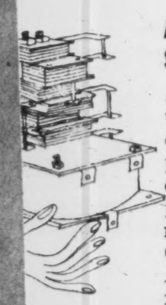
CONTACTS, *for example*

Say the word and we'll up the sizes... switch from fine silver to tungsten, palladium, silver-cadmium oxide, gold contacts, or... you name it!

INSULATION

Laminated phenolic, silicone glass, ceramic steatite, linen-base bakelite, or... you name it!



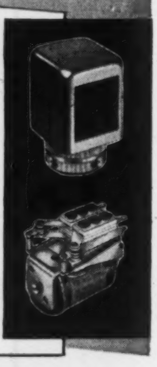


ANYTHING SPECIAL...

ADVANCE will engineer, develop and produce the custom relays you need in minimum time. Call ADVANCE for action.

For **INDUSTRIAL USES**

We build a vast variety of rugged, reliable relays...create superior new designs quickly. You'll find our quality control is now the tightest in the industry.



Write—and let us solve your relay problems

ADVANCE ELECTRIC AND RELAY CO.

2435-Y NORTH NAOMI STREET
BURBANK, CALIFORNIA

For more information circle **305** on inquiry card.

Automatic Elec. Chicago
Automatic Temp. Control
Chatham Electronics
Clare & Co.
General Controls Co.
Durakool Inc.
G-M Labs.
Guardian Elec.Mfg. Co.
Haledy Electronics Co.
H-B Instrument
Kellogg Switchboard
Mack Electric Devices
Mercoid Corp.
Mercury Contacts
Minneapolis-Honeywell
Philadelphia Scientific
Phila. Thermometer
Potter & Brumfield
Precision Scientific
Precision Therm.
Struthers-Dunn
Ward Leonard Elec. Co.
Weston Elec. Inst. Corp.

RELAYS, Motor Driven Time Delay

Abrams Instrument
Advance Elec. & Relay Co.
Allen-Bradley Co.
American Inst. Co.
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Temp. Control
Barber-Colman
Betts & Betts
Bristol Motor Div.
Clarostat Mfg. Co.
Control Engg. Co.
Controls, Inc.
Cook Electric Co.
Cramer Co., Inc.
Cutler-Hammer
Eagle Signal Co.
Friez Instrument Div.
General Controls
General Electric
Guardian Electric
Haydon Co., A. W.
Henschel Corp.
Industrial Eng. Corp.
Industrial Timer
Kurman Electric
Leach Relay Co.
Lumenite Electronics
Minneapolis-Honeywell
Paragon Electric Co.
Philadelphia Scientific
Potter & Brumfield
Price Electric Co.
Square D Co.
Struthers-Dunn
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Zenith Electric Co.

RELAYS, Movable Coil A. C.

Advance Elec. & Relay
Assembly Products
Automatic Elec. Mfg.
Cook Electric Co.
Cutler-Hammer Inc.
Electro-Tech. Equip.
Esterline-Angus Co.
Kurman Electr
GE Apparatus Sales
Roller-Smith Co.
Triplett Elec. Inst.
Union Switch
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Overload

Adams & Westlake
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
American Kloeckner
American Relay & Controls
Autocall Co.
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Switch Co.
Automatic Temp. Control
Bunnell & Co.
Burlington Inst. Corp.
Clare & Co.
Clark Controller Co.
Cook Electric
Cutler-Hammer Inc.
Edison, Instrument Div.
Elgin-Neomatic, Inc.
GE Apparatus Sales
Guardian Elec. Mfg. Co.
G-V Controls, Inc.
Jaidinger Mfg. Co.
Kurman Electric
Leach Relay Co.
Magnecord Electric
Ohmite Mfg.
Perfex Corp.
Phaostron Co.
Pollak Corp.
Potter & Brumfield
Price Electric Corp.
Roller-Smith Co.
Sigma Instruments
Square D Co.
Standard Elect. Prods.
Sterling En'ng
Struther-Dunn
Ward-Leonard Elec.Co.
Westinghouse Elec.

RELAYS, Permanent Magnet Movable Coil

Advance Elec. & Relay
Assembly Products
Automatic Elec. Chicago
Bunnell & Co.
Columbus Products Corp.
Cook Electric Co.
Electric Des. & M'f'g.
Esterline-Angus Co.
GE Apparatus Sales
Guardian Electric
Kurman Electric
Leach Relay Co.
Marion Elec. Inst.
Roller-Smith Co.
Signal Engr. & Mfg.
Triplett Electrical Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Photoelectric

Advance Elec. & Relay Co.
Allied Control Co.
American Inst. Co.
Automatic Temp. Control
Autotron Co.
Avion Div.
Clare & Co.
Comar Electric Co.
Continental Elec. Co.
Cutler-Hammer, Inc.
Deltron, Inc.
Detect-O-Ray
De-Tec-Tronic Corp
Dickson Co.
Eby, Inc.
Edison, Thomas A.
Electro-Mechanical Insts.
Electro-Physics Co.
Electron-Radar Products
Electronic Controls
Electronic Dev. Lab.
El-Tronics, Inc.
Engrg. Research & Dev.
Ess Instrument Co.
Farmer Electric Co.
Fisher-Pierce Co.
General Controls Co.
GE Apparatus Sales
Gorrell & Gorrell
Guardian Electric
Haledy Electronics Co.
Industrial Electronic
International Standard
Larson Instrument
Leach Relay Co.
Lumenite Elec.
Minneapolis-Honeywell
Phaostron Co.
Phillips Control
Phipps & Bird
Phoenix Precision Inst.
Potter & Brumfield
Potter Instrument
Presision Therm.
Relay Service Co.
Rockwell Engr.
Rubicon Co.
Sigma Instruments, Inc.
Triplett Elec. Co.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg.
Weston Elec. Inst. Corp.
Worner Electronic

RELAYS, Pneumatic

Bailey Meter Co.
Black, Sivalls & Bryson, Inc.
Conoflow Corp.
Dahl Co.
Fisher Governor Co.
Foxboro Co.
Hagan Corp.
Johnson Service
Kendall Controls Corp.
Mead Specialties Co.
Minneapolis-Honeywell
Phaostron Co.
Powers Regulator Co
Research Controls

RELAYS, Polarized

Advance Electric & Relay
Allied Control Co.
Assembly Products
Autocall Co.
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Switch
Barber-Colman
Bunnell & Co., J. H.
Clare & Co.
Comar Electric Co.
Cutler-Hammer, Inc.
Eclipse-Pioneer
Edison Inc , T. A.
Elgin-Neomatic, Inc.
Electro-Mechanical Inst.
GE Apparatus Sales
International Standard
Jaidinger Mfg. Co.
Kurman Electric
L. A. B. Corp.
Leach Relay Co.
Magnecord Electric
Marion Elec. Inst.
Matisa Equipment
Maxson Corp.
Miller Co , Bertrand F.
Phaostron Co.
Pollak Corp.
Precision Therm. & Inst.
Price Electric Corp.
Raytheon Mfg.
Sigma Instruments
Signal Engr. & Mfg.
Stevens-Arnold Co.
Struthers-Dunn
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

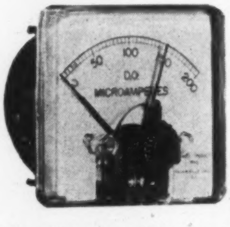
RELAYS, Power

Adams & Westlake
Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
American Inst. Co.
American Relay & Controls
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Switch Co.
Branson Corp.
Clare & Co.
Clark Controller Co
Cook Electric Co.
Cutler-Hammer, Inc.
Detect-O-Ray
Eclipse-Pioneer

Meter Relays

For Sensitive and Accurate Control or Alarm.

Meter-relays provide control of chemical processes or mechanical operations through alarm and automatic shut-off or continuous on-off control. Applications include: Bearing temperature alarm and shut-off on pumps, turbines, generators. Automatic speed controls for machines and conveyors. Computer shut-off if power supply voltage varies. Warning and control in radiation measuring equipment and processes. Automatic switching of standby equipment in microwave communications. Continuous control of pH. Use in radar warning systems.



Bulletin G-6
RANGES:
D.C. or A.C.
0/20 Microamps to 0/50 Amps.
0/5 Millivolts to 0/500 Volts
(Minimum A.C. Range 0/250 Millivolts)

Model 261-C Range 0/200 DC Microamperes. Price $33.00

Trip point adjustable to any point of scale arc. Sensitive to changes as little as 1%. One contact carried on moving pointer. The other on an adjustable pointer. When two pointers meet, contacts close and lock. Holding coil is wound directly over moving coil, locking action is electro-magnetic. Reset can be manual or automatic. Spring action in contacts kicks them apart forcefully. Three sizes of clear plastic models, 2½, 3¾ and 4½ inches (all rectangular). Contact arrangements: High Limit Single, Low Limit Single or Double (both high and low). Contact rating is 5 to 25 milliamperes D.C. Prices from $30 to $90.

Ruggedized Meter-Relays

Metal Cases. Shock-Mounted; Sealed; Models 255-C (2½''), 355-C (3½''), 455-C (4½'')

Same general specifications as plastic case meter-relays described above. Designed for use where unusual shock, vibration, humidity or temperature exists. $10 more than equivalent plastic case meter-relay.

VHS* Relay

(*Very High Sensitivity)

Model 266

Sample specs. are: 0.2 microamperes, (12,000 ohms coil) or, 0.1 millivolts, (5 ohms.)

The VHS is a D'Arsonval moving coil relay, internally shock-mounted. The screw-on cover is gasket sealed. Connections: 9 pin octal style. Dimensions: 1¾ diameter x 2¼ long. Weight: 4 ounces. Sensitivity: Infinite variations from 0.2 Ua. to 10 Amp. or 0.1 Mv. to 500 volts, self contained. Higher volts or amps with external multipliers or shunts. A.C. rectifier types. Trip point accuracies to 1%. Differential 1%. The degree of resistance to shock and vibration depends upon sensitivity and type of action wanted. In general, the relays will not be permanently damaged by shocks of 100G's and vibrations up to 2,000 cps at 3 to 4 G's. The most sensitive relays may close their contacts under these conditions.

Contacts: SPST or SPDT, 5-25 Ma. D.C. Other ratings to ½ Amp. A.C. A locking coil gives high pressure and chatter-free contact even under shock and vibration. Prices $20 to $80.

ASSEMBLY PRODUCTS, INC.
Chesterland 3A, Ohio
Phone: (Cleveland, O.) HAmilton 3-4436

For more information circle **306** on inquiry card.

Esterline-Angus Co.
General Controls Co.
GE Apparatus Sales
Grayhill
Guardian Elec. Mfg.
Hagan Corp.
H-B Instrument
Hetherington & Son
Hi-G, Inc.
Kurman Electric
Leach Relay Co.
Mack Electric Devices
Ohmite Mfg.
Perfex Corp.
Phaostron Co.
Philadelphia Scientific
Phillips Control
Pollak Corp.
Potter & Brumfield
Price Electric Corp.
Robinette Co., W. C.
Roller-Smith Co.
Sigma Instruments
Signal Engr. & Mfg.
Square D Co.
Sterling Eng'ng.
Struthers-Dunn
U. S. Relay Co.
Ward Leonard Elec Co.
Warrick, Chas. F.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RELAYS, Power Factor

Advance Elec. & Relay Co.
Cook Electric Co.
Cutler-Hammer, Inc.
Electronic Control
Esterline-Angus Co.
GE Apparatus Sales
L. A B. Corp.
Leach Relay Co.
Magnecord Electric
Potter & Brumfield
Sangamo Electric
Westinghouse Elec.

RELAYS, Resistance, D. C.

Advance Elec. & Relay Co.
Allied Control Co.
American Relay & Controls
Autocall Co.
Automatic Electric Chicago
Bunnel & Co., J H.
Clare & Co., C. P.
Cook Electric Co.
Cutler-Hammer, Co.
Deltronic Corp.
Devtronics, Inc.
Dormitzer Elec. & Mfg
Edison, Inc. Thomas A.
Electro-Physics Co.
Elgin National Watch
Elgin-Neomatic, Inc.
Esterline Angus
GE Apparatus Sales
Guardian Electric
H-B Instrument
Hedin Tele Technical
Hi-G, Inc.
International Std. Trading
Jaidinger Mfg. Co.
Kellogg Switchboard
Kurman Electric
Leach Relay Co.
Peschel Electronics
Phaostron Co.
Phillips Control
Potter & Brumfield
Price Electric Corp
Servo-Tek Products
Sigma Instruments
Signal Engr. Mfg.
Union Switch
Ward Leonard Elec. Co.

RELAYS, Stepping

Advance Elec. & Relay
Allied Control Co.
Autocall Co.
Automatic Elec. Chicago
Automatic Elec. Mfg.
Clare & Co.
Collins Radio Co.
Control Engg. Co.
Cook Electric
Corbett Science Labs.
Cutler-Hammer
Daystrom Inst.
Federal Telephone
GE Apparatus Sales
Guardian Electric
International Std. Trading
Leach Relay Co.
Leland, Inc., G. H.
Lumenite Electronic
Oak Mfg. Co.
Potter & Brumfield
Price Electric Corp.
Roller-Smith
Square D Co.
Sterling Eng'ng
Struthers-Dunn
Union Switch
Westinghouse Elec.

RELAYS, Telephone Auxiliary Ringing

Advance Elec. & Relay
Allied Control Co.
American Relay
Autocall Co.
Automatic Elec. Chicago
Clare & Co.
Comar Elec. Co.
Cook Electric
Federal Telephone
Guardian Electric
Henschel Corp.
International Std. Trading
Kellogg Switchboard
Kurman Electric
Leach Relay Co.
Magnecord Electric
Phillips Control
Potter & Brumfield
Price Electric Corp.
Sigma Instruments
Signal Engr. & Mfg.
Sterling Eng'ng.
Struthers-Dunn
U. S. Relay Co.

RELAYS, Temperature

Advance Elec. & Relay Co.
Allen-Bradley Co.
Assembly Products
Autocall Co.
Automatic Temp. Control
Bar-Ray Products
Bristol Co.
Clare & Co., C. P.
Cook Electric Co.
Electro-Physics Co.
Elgin-Neomatic, Inc.
Fielden Instrument
Friez-Instrument Div.
General Controls
GE Apparatus Sales
Gleason-Avery, Inc.
G-M Laboratories, Inc.
Guardian Electric
G-V Controls
H-B Instrument
Jaidinger Mfg. Co.
Kybernetes Corp.
Larson Instrument
Lewis Engineering
Leach Relay Co.
Minneapolis-Honeywell
Perfex Div.
Potter & Brumfield
Powers Regulator Co.
Process & Instruments
Square D Co.
Soreng Products
Spencer Thermostat Co.
Struthers-Dunn
Triplett Elec. Inst.
Westinghouse Elec.
Weston Electrical Inst.

RELAYS, Temperature Compensated

Advance Elec. & Relay
Airpax Products
Betts & Betts
Branson Corp.
Cutler-Hammer Inc.
Edison, Inc., Thomas
Elgin-Neomatic, Inc.
Elgin National Watch
Fuel Watchman
General Electric
Guardian Electric
G-V Controls, Inc.
Jaidinger Mfg. Co.
Kurman Electric
Leach Relay Co.
Milwaukee Gas
Minneapolis Honeywell
Phaostron Co.
Pollak Corp.
Sigma Instruments
U. S. Relay Co.
Wallace & Tiernan

RELAYS, Thermal Time Delay

Adams & Westlake
Advance Elec. Relay Co.
Allen-Bradley Co.
American Inst. Co.
American Relay & Controls
Amperite Corp.
Autocall Co.
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Switch Co.
Automatic Temp. Control
Betts & Betts
Branson Corp.
Clare & Co.
Clarostat Mfg. Co.
Comar Electric Co.
Cook Electric Co.
Cramer Co., Inc.
Curtiss-Wright
Cutler-Hammer, Inc.
Dormitzer Elect. & Mfg.
Durakool Inc.
Eagle Signal Corp.
Edison, Inc., Thomas
Elastic Stop Nut
Electronic Prod. Co.
E-T-A Products
Fisher-Pierce Co.
General Controls
G E Apparatus Sales
Guardian Elec. Mfg. Co.
G-V Controls
Haledy Electronic
Industrial Eng. Corp.
Industrial Timer Corp.
Jaidinger Mfg. Co.
Leach Relay Co.
Lumenite Electronics
Meletron Corp.
Minneapolis-Honeywell
National Time & Signal
Partlow Corp.
Perfex Corp.
Photoswitch Div.
Westinghouse Elec.

RELAYS, Time Delay

Abrams Instrument
Adams & Westlake Co.
American Gas Accumulator
Clare & Co.
Clark Controller Co.
Control Engg. Co.
Cramer Co., Inc.
Dormitzer Elec. & Mfg.
Durakool, Inc.
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Elastic Stop Nut Corp.
G.M. Mfg. Co.
Guardian Elec. Mfg.
G.V. Controls
Haydon Mfg. Co.
Heinemann Elec. Co.
Ohmite Mfg.
Phaostron Co.
Ward Leonard Elec. Co.

RELAYS, Transformer (Low Voltage)

Advance Elec. & Relay Co.
Allen-Bradley Co.
Allied Control Co.
Auth Elec. Spec.
Automatic Electric Chicago
Barber-Colman
B.W. Controller Corp.
Control Engg. Co.
Cook Electric Co.
Cutler-Hammer
Friez Instrument Div.
General Controls
G E Apparatus Sales
Gleason-Avery, Inc.
Guardian Elec. Mfg.
H-B Instrument
Industrial Eng. Corp.
International Std. Trading
Leach Relay Co.
Lumenite Electronics
Magnecord Electric
Mercoid Corp.
Miller Co., Bertrand F.
Minneapolis-Honeywell
Partlow Corp.
Perfex Corp.
Potter & Brumfield
Sigma Instruments, Inc.
Soreng Products
Square D Co.
Struthers-Dunn
Thordarson Elec. Mfg.
Union Switch
U.S. Relay Co.
Ward Leonard
Warrick Co.
Westinghouse Elec.
White-Rodgers Electric

RELAYS, Vacuum Contact

American Inst. Co.
Chatham Electronics
Clare & Co.
Cutler-Hammer
Edison, Inc., Thomas
Eitel McCullough
Electro-Mechanical Insts.
Elgin National Watch
General Elec. Co.
H-B Instrument
Lumenite Electronics
Mack Electric Devices
Pollak Corp.
Rockwell Engr.
Skaneateles Mfg. Co.
Struthers-Dunn, Inc.

RELAYS, Vacuum Tube

Advance Elec. & Relay Co.
Advanced Electronics
Allied Control Co.
American Inst. Co.
Amperite Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Berkshire Laboratories
Bristol Co.
Continental Elec. Co.
Cook Electric

TYPE
TIMING
COIL
AGASTAT
TIME DELAY

AGASTAT

Compact . . . Dust-Proof

TIME DELAY RELAYS

solenoid actuated—pneumatically timed

Introduces time delays into a-c or d-c circuits. Easily adjusted to provide delays ranging from 0.1 second to five or more minutes.

The AGASTAT is small, light, and operates in any position. Dust-proof timing chamber assures long operating life with a minimum of maintenance.

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Smallest
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Anti-Vibration

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Available Anywhere!

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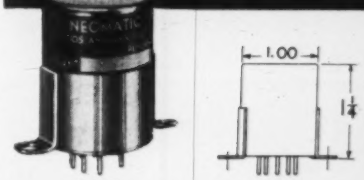
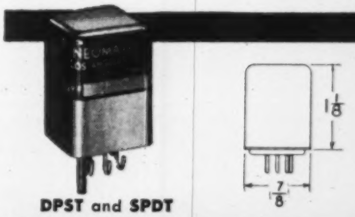
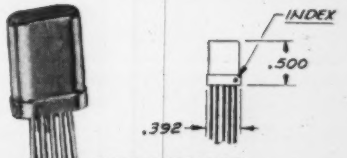
A SUBSIDIARY OF ELGIN NATIONAL WATCH COMPANY
Manufacturers of the largest line
of sub-miniature relays in the world



DPDT



DPST and SPDT



SPDT (NEOMITE)

SPDT · DPST · DPDT

Open or hermetically sealed. Operation as low as 0.065 watts. High contact current. Sensitive relays (NEOMITE) as low as 0.010 watts. Hermetically sealed units, plug-in or solder terminal. Variety of mounting brackets. Standard units will meet or exceed MIL-R-5757B. Life into the millions of operations. Vibration characteristics: Withstands 20gs, 17 to 500 cycles on most models, some as high as 20gs to 1000 cycles per second. Temperature ranges: Available −65 C to 85 C to 100 C and 200 C without size increase.

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9010 Bellanca Ave., Los Angeles 45, Cal.
ORegon 8-3814

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DELAY RELAYS

and

BALLAST REGULATORS

... they're finest ... cost less!

Thermostatic DELAY RELAYS

MOST COMPACT, HERMETICALLY SEALED

Provide delays ranging from 2 to 150 seconds.

- Actuated by a heater, they operate on A.C., D.C., or Pulsating Current.
- *Hermetically sealed.* Not affected by altitude, moisture, or other climate changes.
- Circuits: *SPST only* — normally open or normally closed.

Amperite Thermostatic Delay Relays are compensated for ambient temperature changes from —55° to +70°C. Heaters consume approximately 2 W. and may be operated continuously. The units are *most compact, rugged, explosion-proof, long-lived,* and — *inexpensive!*

TYPES: Standard Radio Octal, and 9-Pin Miniature.

PROBLEM? Send for Bulletin No. TR-81

Also — a new line of **Amperite Differential Relays** — may be used for *automatic overload, over-voltage, under-voltage or under-current protection.*

STANDARD

MINIATURE

BALLAST REGULATORS

- Amperite Regulators are designed to keep the current in a circuit ***automatically regulated*** at a definite value (for example, 0.5 amp).
- For currents of 60 ma. to 5 amps. *Operates on A.C., D.C., Pulsating Current.*
- Hermetically sealed, light, compact, and most inexpensive.

T9 BULB

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Write for 4-page Technical Bulletin No. AB-51

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AMPERITE REGULATOR
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T9
MAX
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30
20
10
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Electronic Dev. Lab.
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International Instrument
International Std. Trading
Kellogg Switchboard
Kinetic Instrument
L. A. B. Corp.
Leach Relay Co.
Lumenite Electronics
Mack Electric Devices
Metron Instrument
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Phipps & Bird
Precision Therm.
Process & Instruments
Raytheon Mfg.
Robinette Co., W. C.
Rockwell Engr. Co.
Servo-Tek Products
Sigma Instruments
Skaneateles Mfg. Co.
Struthers-Dunn
Sylvania Elec. Prods.
Union Switch
Vacuum Tube Prods.
Weston Elec. Inst.
Wilson & Co.

RELAYS, Voltage

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Allen-Bradley Co.
Allied Control Co.
American Instrument
American Relay & Control
Amperite Co.
Autocall Co.
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Switch Co.
Barber-Colman
Branson Corp.
Clare & Co., C. P.
Clark Controller Co.
Comar Electric
Cook Electric
Cutler-Hammer
Deltronic Corp.
Eby, Inc., Hugh H.
Eclipse-Pioneer
Elgin National Watch
Elgin-Neomatic, Inc.
Esterline-Angus Co.
Ferranti Electric, Inc.
General Controls
G. E. Apparatus Sales
Guardian Electric
G-V Controls
Hart Manufacturing Co.
Hathaway Inst. Co.
H-B Instrument
Jaidinger Mfg. Co.
Kurman Electric
Leach Relay Co.
Lumenite Electric
Magnecord Electric
Milwaukee Gas
Ohmite Mfg.
Perfex Corp.
Phaostron Co.
Phillips Control
Pollak Corp.
Potter & Brumfield
Price Electric
Relay Service Co.
Reliance Instrument Co.
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Sigma Instruments
Signal Engr. & Mfg.
Simpson Electric
Struthers-Dunn
Sylvania Elec. Prod.
Triplett Electrical Inst.
Union Switch
U. S. Relay Co.
Varo Mfg. Co.
Ward Leonard Elec. Co.
Westinghouse Elec.
Weston Electrical Inst.

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Airborne Accessories
AiResearch Mfg.
Airflo Instrument
American Elec. Mfg.
American Electroneering
American Electronic Labs.
American Kloeckner
A.R.F. Products
Arga Div.
Aroa Div., Beckman Inst.
Austin Co.
Authorized Manufacturers
Automatic Control
Automatic Elec. Chicago
Automatic Switch
Bailey Meter
Barber Colman
Bendix Aviation
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Applied Science Corp.
Automatic Elec. Chicago
Automatic Switch

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NEVER BEFORE such a simplified method of telemetering! Over a single pair of wires, multiple control of great numbers of functions is possible. The unit is rugged, compact, economical to run—an ultra reliable machine that affords complete plant control with the push of a button or switch.

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- Control Equipment & Systems
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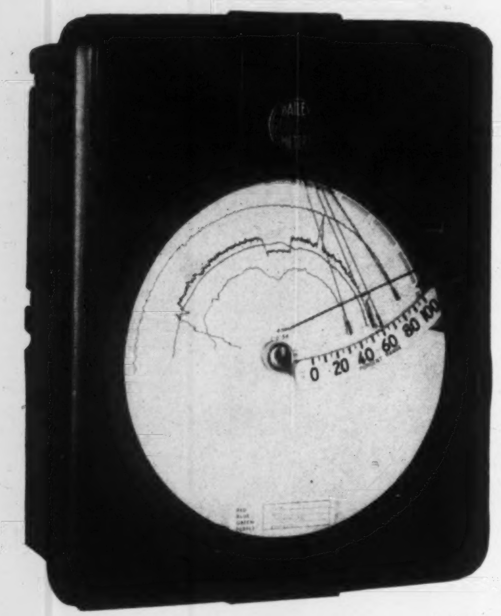

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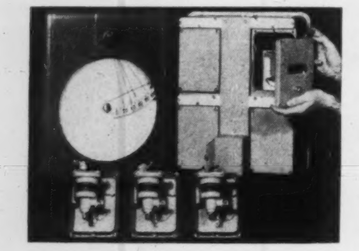
A Receiver-Recorder for Pneumatic and Electric Transmission Systems

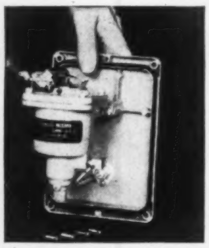
Provides one to four continuous chart records of any measured variables which may be converted to electric or pneumatic signals.

THE BAILEY RECORDER OFFERS YOU THESE UNIQUE TIME AND MONEY SAVING ADVANTAGES—



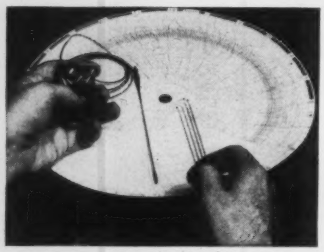
FLEXIBILITY

made possible by "plug-in," pre-calibrated electronic and pneumatic receivers. Permits easy field adaptation to revised application requirements.



UNIVERSAL APPLICATION

of pneumatic receivers which operate on standard SAMA ranges of 3-15 or 3-27 psig; require no field calibration.



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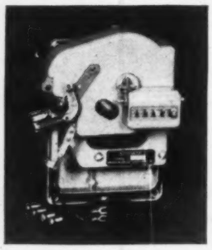

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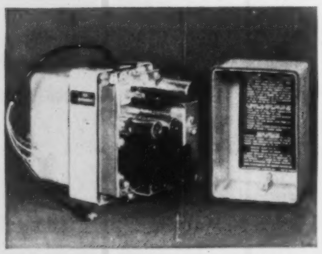
from linear and non-linear transmitters by escapement type integrators. Two integrators may be mounted in same recorder casing.



STANDARDIZATION

of electrical components used in a-c and d-c circuit designs of electronic receivers results in smaller stock of spare parts.

ADDITIONAL FEATURES

1. Select green, tan, grey, or black enamel finishes at no additional expense.
2. Panel Mount with three simple, sturdy clips.
3. Change charts quickly, easily with one-motion magnetic chart nut and automatic pen lifter.
4. Order from stock; receive shipment without delay. For details, write for Product Specification E12-5.

P36-1

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INSTRUMENTS AND CONTROLS

For Power And Process

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Mason-Neilan Regulator
Pacific Div.
Revere Corp.
Servo Corp. of America
Skaneateles Mfg. Co.
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Sterling Precision Inst.
Westinghouse Elec.

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Automatic Temp. Control
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Bristol Co.
Brooks Rotameter
Builders-Providence
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Hagan Corp.
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Sangamo Electric
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Eastern Specialty Co.
GE Apparatus Sales
Hardwick, Hindle, Inc.
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MagElec. Products
Ohmite Mfg.
Peschel Electronics
Precision Resistor Co.
Rex Rheostat
Shallcross Mfg.
Thordarson-Meissner
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Daven Co.
Electronic Dev. Lab.
G E Apparatus Sales
General Radio Co.
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Instrument Resistors
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Kay Electric
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Mallory & Co.
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Polytechnic Res. & Dev.
Precision Resistance
Precision Resistor Co.
Resistance Products
Rex Rheostat
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sprague Electric Co.
Ward Leonard
Westinghouse Elec.

RESISTORS, Adjustable

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Ahrendt Instrument
Allen-Bradley Co.
Anatran Engineering
Black, Sivalls & Bryson
Bourns Labs.
Carter Parts Co.
Centralab Div.
Chatham Electronics
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Corbett Science Labs. F.W.
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Daven Co.
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Erie Resistor
Fairchild Camera (Pot Div.)
Foxboro Co.
G E Apparatus Sales
General Radio Co.
Goodyear Aircraft
Hardwick, Hindle, Inc.
Instrument Resistors Co.
International Resistance
I.T.E. Circuit Breaker
Lectrohm Inc.
Leeds & Northrup
Lewis Engineering
Mallory & Co.
Model Engineering
Ohmite Mfg. Co.
Precision Resistance Co.
R.C.L. Mfg. Co.
Reon Resistor Corp.
Resistors, Inc.
Rex Rheostat Co.
Rochester Electronics
Rubicon Co.
Sprague Electric Co.
Stackpole Carbon
Sticht Co.
Technology Instrument
Topp Industries
Vectron Inc.
Walker-Jamieson, Inc.
Ward Leonard Electric Co.
Welch Scientific
Westinghouse Elec.

RESISTORS, Carbon Composition

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Allen-Bradley Co.
Beck Bros.
Biddle Co., Jas. G.
Bourns Labs.
Central Scientific
Eastern Specialty Co.
Eclipse-Pioneer Div.
Glenco Corp.
Goodyear Aircraft
Instrument Resistors
Keystone Carbon
Mallory & Co.
Morganite, Inc.
Natl. Carbon Co., Inc.
Ohio Carbon Co.
Phaostron Co.
Stackpole Carbon
Texas Instruments
Welch Scientific Co.

RESISTORS, High Frequency

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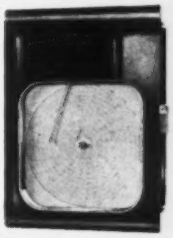
Beck Bros.
Black, Sivalls & Bryson

Bristol's® Metameter® Telemeters

for remote measurement, indicating, recording and automatic control

Bristol's Metameter Telemeters measure pressure, flow, temperature, liquid level, motion and gate position, voltage, current, power, totalized power load, and reactive volt-amperes at remote points from a few feet to many miles away. Very wide choice of transmitting media: carrier channel, telephone, private wires, radio beam (microwave, VHF, and UHF), multiplexing and selective calling—or any convenient circuit you may select. Many electric and electronic instruments (round- and strip-chart) available. Write for Bulletin M1710.



Series 500 Receiver

BRISTOL COMPANY

112 Bristol Rd., Waterbury 20, Conn.

For more information circle **312** on inquiry card.

Clarke Inst. Corp.
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Corning Glass Works
Dale Products Inc.
Daven Co.
Empire Devices
Erie Resistor Corp.
Fish-Schurman Corp.
GE Apparatus Sales
General Radio Co.
Goodyear Aircraft
Hardwick, Hindle, Inc.
Instrument Resistors Co.
International Resistance
I. T. E. Circuit Breaker
Kay Electric
Leeds & Northrup Co.
Madison Elec. Prod. Div.
Mallory & Co.
Measurements Corp.
Model Engineering
Ohmite Mfg. Co.
Phaostron Co.
Polarod Electronics
Polytechnic Res. & Dev.
Rex Rheostat
Resistance Products Co.
Sangamo Electric
Shallcross Mfg. Co.
Sprague Electric Co.
Technology Instrument
Ward Leonard Elec. Co.

RESISTORS, High Voltage

Arnhold Ceramics Inc.
Associated Research
Beck Bros.
Black, Sivalls & Bryson
Clarostat Mfg. Co.
Corbett Science Labs., F.W.
Cutler-Hammer, Inc.
Dale Products Inc.
GE Apparatus Sales
Hardwick, Hindle, Inc.
Instrument Resistors Co.
International Resistance
I. T. E. Circuit Breaker
J B L Instrument Co.
Kay Electric
Leeds & Northrup
Madison Elec. Prod. Div.
Mallory & Co.
Mepco
Micro-Circuits Co.
Ohmite Mfg. Co.
R. C. L. Mfg. Co.
Reiner Electronics
Resistance Products Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Simpson Electric Co.
Sprague Electric
Victoreen Inst. Co.
Ward Leonard Electric Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
White Industrial, S. S.

RESISTORS, Manganin

Associated Research
Avion Instrument Corp.
Beck Bros.
Black, Sivalls & Bryson
Brown Electro-Measurement
Cinema Engr.
Corbett Science Labs. F. W.
Dale Products Inc.
Daven Co.
De Jur-Amsco
Eastern Precision Resistor
Electro-Mec Lab.
Electronic Dev. Lab.
Federal Instrument
General Radio Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Hycor Co., Inc.
Instrument Resistors Co.
I. T. E. Circuit Breaker
Jarvis Electronics Corp.
Leeds & Northrup Co.
Madison Elec. Prod. Div.
Mepco
Norton Electrical
Ohmite Mfg. Co.
Osborne Electric
Radio City Products
Reiner Electronics
Reon Resistor Corp.
Resistance Products Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sprague Electric
Westinghouse Elec.

RESISTORS, Molded

Aerovox Corp.
Allen-Bradley Co.
Beck Bros.
Cinema Engr.
Clarostat Mfg. Co.
Cutler-Hammer Inc.
Dale Products Inc.
Daven Co.
Eastern Precision Resistor
Erie Resistor Corp.
General Elec. Co.
Instrument Resistor Co.
International Resistance
I. T. E. Circuit Breaker
Lectronic Research Labs.
Mepco
Ohmite Mfg. Co.
Radio City Products
Reiner Electronics
Reon Resistor Corp.
Resistance Products Co.
Shallcross Mfg.
Sprague Electric
Westinghouse Elec.
White Industrial, S. S.

RESISTORS, Negative Temperature Coefficient

Black, Sivalls & Bryson
Carboloy Dept., GE
Clarostat Mfg. Co.
Corbett Science Labs., F.W.
Daven Co.
Erie Resistor
Federal Telephone
Friez Instrument Div.
Keystone Carbon Co.
Mepco, Inc.
Micro-Circuits Co.
Model Engineering
Phaostron Co.
Polytechnic Res. & Dev.
Precision Resistance Co.
Reon Resistor Corp.
Rex Rheostat
Shallcross Mfg. Co.
Sprague Electric
States Co.
Stupakoff Ceramic
Victory Engr.

RESISTORS, Non-Inductive

Aerovox Corp.
Arnhold Ceramics
Associated Research
Automatic Electric, Chicago
Avion Instrument
Black, Sivalls, & Bryson
Brown Electro-Measurement
Cinema Engr.
Clarostat Mfg. Co.
Continental Carbon
Corbett Science Labs.
Corning Glass Works
Dale Products Inc.
Daven Co.
Eastern Precision
Electro-Measurements
Electro-Mec Lab.
Elektro-Serv Co.
General Electric
General Radio
Gray Instrument
Hardwick, Hindle, Inc.
Hycor Co.
Instrument Resistors Inc.
International Industries
Ircal Industries
I.T.E. Circuit Breaker
Kay Electric
Lectrom, Inc.
Leeds & Northrup Co.

ROTARY
STEP

CINEMA *potentiometers*

for
INSTRUMENTS AND CONTROL CIRCUITS

Available in accuracies from 1% to .025%, 1/10 ohm to 10 megohms. For direct current and frequencies up to 20 kc. Write for catalogue on your letterhead.

CINEMA ENGINEERING CO.
DIVISION AEROVOX CORPORATION
1100 CHESTNUT ST. • BURBANK, CALIF.

For more information circle **313** on inquiry card.

HYCOR

PRECISION WIRE-WOUND

RESISTORS

new low prices

Improved manufacturing methods at Hycor have cut our costs of production. We pass these savings on to you in reduced prices.

Send for Bulletin R2

Reliable components

Hycor takes the time and employs the exact techniques needed to insure that every detail of manufacture is **right.** You'll find, as our customers have found, that this careful fabrication produces really dependable resistors.

HYCOR CO.
NO. HOLLYWOOD
CALIFORNIA

HYCOR
Company, Inc.

Subsidiary of International Resistance Company
11423 VANOWEN STREET, NORTH HOLLYWOOD 8, CALIF.

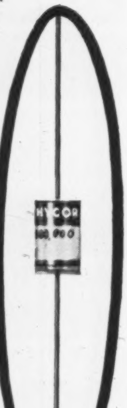
NEWLY-
DEVELOPED
Sub Miniature
Type 10
H-SERIES

hermetically sealed resistors

The "H" Series Precision Resistors are encapsulated in a tough plastic compound. The result is a solid, homogeneous unit with unparalleled ruggedness, **impervious to the effects of moisture, thermal shock and mechanical shock.** The plastic is filled with heat conducting mineral which dissipates the heat and equalizes the "hot spots" in the resistor winding. The sealed-in terminal connections are welded.

SPECIFICATIONS:

MILITARY SPECIFICATIONS: Performance characteristics satisfy all requirements of MIL-R-93A & JAN-R-93.
TEMPERATURE COEFFICIENT: ±0.0022% per degree C.
OPERATING TEMPERATURE: −65°C. to +125°C.
RESISTANCE ACCURACY: Standard resistance tolerances are 1%, 0.5%, 0.25% and 0.1%.
TYPE 10 (illustrated): 1/4" dia. x 1/2" long. Resistance range: 1.0 ohm −0.35 meg.



Send for Bulletin H for complete description on other physical sizes and wattage ranges.

HYCOR
Company, Inc.

11423 VANOWEN ST., N. HOLLYWOOD 8, Cal.
Subsidiary of International Resistance Company

For more information circle **314** on inquiry card.

Mepco
Model Engineering
Micro-Circuits Co.
Ohmite Mfg.
Phaostron Co.
Physics Research
Polytechnic Res. & Dev.
Precision Resistance Co.
R.C.L. Mfg. Co.
Reon Resistor Corp.
Resistance Products Co.
Rex Rheostat
Rubicon Co.
Sangamo Electric
Shallcross Mfg. Co.
Sprague Electric
States Co.
Ward Leonard Electric
Western Radiation Lab.
Weston Elect. Inst.

RESISTORS, Standard (See Standards, resistance)

RESISTORS, Tape
Aerovox Corp.
Gulton Mfg. Corp.
Hansen Electronics Co.
Phaostron Co.

RESISTORS, Variable
Ace Electronics
Aerovox Corp.
Ahrendt Instrument
Allen-Bradley Co.
Beck Bros.
Biddle Bros., Jas. G.
Black, Sivalls & Bryson
Bourns Labs.
Brown Electro-Measurement
Centralab Div.
Clarosat Mfg. Co.
Corbett Science Labs.
Cutler-Hammer Inc.
Dale Products Inc.
Daven Co.
DeJur-Amsco
Edcliff Instruments
Electro-Mec Labs.
Fairchild Camera
Federal Instrument
Ford Engineering
G E Apparatus Sales
General Radio Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Helipot Div.
Instrument Resistors Co.
International Resistance
Jarvis Electronic Corp.
Lectrohm Inc.
Lectronic Research Labs.
Leeds & Northrup
Lewis Engineering
Mallory & Co.
Natl. Elec. Controller
Ohmite Mfg. Co.
Physics Research
Precision Resistance
R.C.L. Mfg. Co.
Resistors, Inc.
Rex Rheostat Co.
Rubicon Co.
Servotrol Co.
Shallcross Mfg.
Stackpole Carbon
Sticht Co.
Technology Instrument
Topp Industries
United Optical Mfg.
Vectron Inc.
Victory Engr. Co.
Ward Leonard Electric
Welch Scientific

RESISTORS, Wire Wound
Ace Electronics
Aerovox Corp.
Ahrendt Instrument
Associated Research
Automatic Elec. Chicago
Beck Bros.
Biddle Co., Jas. G.
Borg Corp.
Bourns Labs.
Brown Electro-Measurement
Carter Parts Co.
Centralab Div.
Cinema Engr.
Clark Controller Co.
Clarostat Mfg. Co.
Continental Carbon
Corbett Science
Cutler-Hammer Inc.
Dale Products Inc.
Daven Co.
DeJur-Amsco
Eastern Precision Resistor
Electro Measurements
Electro-Mec Lab.
Electronic Associates
Electro-Tech Equip.
Electron-Radar Prod.
Federal Instrument
G E Apparatus Sales
General Radio Co.
Goodyear Aircraft
Gorman Mfg. Corp.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Hycor Co.
Instrument Resistors Co.
International Resistance
Ircal Industries
I. T. E. Circuit Breakers
Jarvis Electronics Corp.
Kirkland Co., H. R.
Lectrohm, Inc.
Leeds & Northrup Co.
Madison Elec. Prod. Div.
Mallory & Co.
Mepco
Model Engineering
National Electric Control
Ohmite Mfg.
Osborne Electric
Phaostron Co.
Precision Resistance Co.
R. C. L. Mfg. Co.
Reon Resistor Corp.
Resistance Prod. Co.
Resistors Inc.
Rex Rheostat Co.
Rubicon Co.
Sangamo Electric
Sensitive Research Inst.
Servotrol Co.
Shallcross Mfg. Co.
Simpson Electric Co.
Sprague Electric Co.
Square D Co.
Sticht Co.
Technology Instrument
Topp Industries
Ward Leonard Electric Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

RESTORER, Thermocouple
Peerless Electric

RETICLES
Gaertner Scientific Corp.
Gurley, W. & L. E.
Herd & Co., Harold H.
Mann Co., Wm. I.
Mico Instrument Co.

RHEOSTATS, Battery Charging
Allen-Bradley Co.
Beck Bros.
Black, Sivalls & Bryson
Centralab Div.
Clarostat Mfg. Co.
Cutler-Hammer, Inc.
DeJur-Amsco
Hardwick, Hindle, Inc.
International Resistance
Mallory & Co.
Mepco
Natl. Elec. Controller
Ohmite Mfg. Co.
Rex Rheostat Co.
Ward Leonard Elec. Co.

RHEOSTATS, Field
Black, Sivalls & Bryson
Clark Controller Co.
Corbett Science Lab.
Cutler-Hammer, Inc.
Dittmore & Freimuth
General Electric Co.
G E Apparatus Sales
Hardwick, Hindle, Inc.
Mallory & Co.
Model Engineering
Natl. Elec. Controller
Ohmite Mfg. Co.
Rex Rheostat
Ward Leonard Elec. Co.

RHEOSTATS, Laboratory
Ace Glass Inc.
Allen-Bradley Co.
American Inst. Co.
Beck Bros.
Beckman Inst.
Biddle Co., Jas. G.
Black, Sivalls & Bryson
Borg Corp.
Brown Electro-Measurement
Central Scientific
Centralab Div.
Chicago Apparatus Co.
Clarostat Mfg. Co.
Corbett Science Lab.
Cutler-Hammer, Inc.
Daven Company
DeJur-Amsco
Eastern Specialty Co.
Edcliff Instruments
Electro-Mec Lab.
Electronic Associates
Ford Engineering
General Radio Co.
G-M Labs.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Helipot Div.
International Resistance
Mallory & Co.
Model Engineering
Natl. Elec. Controller
Ohmite Mfg. Co.
Rex Rheostat Co.
Rubicon Co.
Schaefer Bros. Co.
Sticht Co.
Technology Instrument
Thwing-Albert Inst. Co.
Ward-Leonard Elect. Co.
Welch Scientific
Zeiss, Inc., Carl

RHEOSTATS, Meter Testing
Allen-Bradley Co.
Beck Bros.
Biddle Co., Jas. G.
Black, Sivalls & Bryson
Clarostat Mfg. Co.
Bourns Labs.
Daven Co.
DeJur-Amsco Corp.
Eastern Specialty Co.
G E Apparatus Sales
Gray Instrument Co.
Hardwick, Hindle, Inc.
International Resisance
Leeds & Northrup
Mallory & Co.
Natl. Elec. Controller
Ohmite Mfg. Co.
Rex Rheostat Co.
Rubicon Co.
Shallcross Mfg.
States Co.
Ward Leonard Elec. Co.

RHEOSTATS, Slide Wire
Ace Electronics
Beck Bros
Beckman Inst.
Biddle Co., Jas. G.
Black, Sivalls & Bryson
Borg Corp.
Brown Electro-Measurement
Central Scientific Co.
Chicago Apparatus Co.
Clarostat Mfg. Co.
Corbett Science Labs., F.W.
Cutler-Hammer, Inc.
Electro-Mec. Lab.
Electro-Measurements
Ford Engineering
General Radio Co.
Giannini & Co.
Gray Instrument Co.
Hardwick, Hindle, Inc.
Helipot Corp.
Leeds & Northrup
Mallory & Co.
Natl. Elec. Controller
Ohmite Mfg. Co.
Rex Rheostat Co.
Rubicon Co.
Shallcross Mfg. Co.
Standard Science Supply
Sticht Co.
Technology Instrument
Thwing-Albert Inst. Co.
Welch Scientific
Vectron, Inc.

RIDEOMETERS, RIDE COMFORT Recorder & Riding-Quality Instruments
Brush Electronics
Calidyne Co.
Commercial Research
Impact Register Co.
Jaeger Watch Co.
Saxl Instrument
Sperry Products, Inc.
Testing Machines Inc.

ROTAMETERS (See Flowmeters, Area, Free Float Type)

RUBBER STOPPERS
Ace Glass Co.

RULES, Adjustable Curve (See Drawing Instruments)

RULES, Aluminum
Bowen & Co.
Bruning Co., Inc.
Dietzgen Co., Eugene
Gaertner Scientific
Gurley, W. & L. E.
Keuffel & Esser Co.
Lufkin Rule Co.
Miller Dial & Name Plate
Premier Metal Etching
Renick Co.
Stratex Instrument Co.
Warren-Knight Co.

RULES, Brass
Bliss & Co.
Brown & Sharpe
Bruning Co., Inc.
Gaertner Scientific
Grammes & Sons
Gurley, W. & L. E.
Lufkin Rule Co.
Mico Instrument Co.
Miller Dial & Name Plate
Premier Metal Etching
Renick Co.
Starrett Co.
Warren-Knight Co.

RULES, Caliper
American Measuring Inst.
Brown & Sharpe
Dixon, Inc., Wm.
Glogau & Co.
Lufkin Rule Co.
Millers Falls Co.
Scherr Co., Inc.
Starrett Co.
Warren-Knight Co.

RULES, Drafting Room (See Drawing Instruments)

RULES, Folding
Bliss & Co.
Bruning Co.
Dietzgen Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Post Co., Frederick
Speidel & Co.
Starrett Co.
Stratex Instrument Co.
Warren-Knight Co.
Weber Co.
White Co., David

RULES, Glass
Davidson Mfg. Co.
Dusenbery Co.
Electronic Products
Engineers Specialty Div.
Engis Equipment
Fish-Schurman Co.
Gaertner Scientific
Glass Engraving Co.
Gurley, W. & L. E.
Kontes Glass Co.
Lufkin Rule
Mann Co., W. I.
Mico Instrument Co.
Penn Optical & Inst.
Phoenix Prec. Inst.

Renick Co.
Scientific Glass App.

RULES, Parallel
American Meas. Insts.
Bliss & Co.
Bruning Co.
Dietzgen Co.
Hamilton Mfg. Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Negus, T. S, & J. D.
Opplem Co.
Premier Metal Etching
Speidel & Co.
Starrett Co., L. S.
Warren-Knight Co.
White Co., Inc.
Weber Co.

RULES, Precision Standard
Amer. Measuring Insts.
Bowen & Co.
Brown & Sharpe
Do All Co
Engineers Specialty Div.
Engis Equipment
Gaertner Scientific Corp.
Griswold Mfg. Co.
Gurley, W. & L. E.
Lufkin Rule Co.
Renick Co.
Scherr Co., Inc.
Starrett Co.

RULES, Shrinkage
Brown & Sharpe
Keuffel & Esser Co.
Lufkin Rule Co.
Speidel & Co.
Starrett Co.
Warren-Knight Co.
Weber Co.

RULES, Slide (See Drawing Instruments)

RULES, Stainless Steel
Brown & Sharpe
Bruning Co.
Dietzgen Co.
Do All Co.
Gaertner Scientific
Gurley, W. & L. E.
Lufkin Rule Co.
Miller Dial & Name Plate
Premier Metal Etching
Renick Co.
Stafford Co.
Starrett Co., L. S.

RULES, Steel
American Measuring Insts.
Bowen & Co.
Brown & Sharpe
Dietzgen Co.
Do All Co.
Engis Equipment
Gaertner Scientific
Gurley, W. & L. E.
Keuffel & Esser Co.
Lufkin Rule Co.
Mico Instrument Co.
Millers Falls Co.
Premier Metal Etching
Renick Co.
Scherr Co., Inc.
Speidel & Co.
Starrett Co.
Warren-Knight Co.
Weber Co.

RULES, Wood
Berger & Sons
Bruning Co.
Dietzgen Co.
Graf-Apsco Co.
Henschel & Co.
Keuffel & Esser Co.
Lufkin Rule Co.
Post Co., Frederick
Speidel & Co.
Warren-Knight Co.
Weber Co.

RUNNING TIME RECORDERS
Advanced Electronics
Aero Instrument
Alden Products
American Time Prod.
Amglo Corp.
Bacharach Indus. Inst.
Berkeley Scientific
Bristol Co.
Burlington Inst.
Central Scientific
Cincinnati Time Rec.
Cramer Co., Inc.
Doelcam Div.
Esterline-Angus Co.
GE Apparatus Sales
Gorrell & Gorrell
Gotham Inst. Div.
Haydon, A. W.
Hobbs Corp., S. W.
Larson Instrument
Lumenite Electronic
Marion Electrical Inst.
Streeter-Amet Co.
Thwing-Albert Inst.
U. S. Gauge
Weksler Thermometer
Westinghouse Elec.

RUNNING TIME TOTALIZERS
Aero Instrument
Berkeley Scientific
Bristol Co.
Burlington Inst.
Cincinnati Time Rec.
Cramer Co., Inc.
Dale Instruments
Doelcam Corp.
Epsco, Inc.
Fischer & Porter
General Electric
Gorrell & Gorrell
Haydon Co., A. W.
Industrial Timer Corp.
Jaeger Watch Co.
Larson Instrument
Lumenite Electronic
Marion Electrical Inst.
Production Instrument
Roller-Smith
Sangamo Electric
Serdex, Inc.
Standard Elec. Time
Stewart Instrument
Wright Engineering

RUPTURE DISKS
Baker & Co., Inc.
Black, Sivalls & Bryson
Frangible Discs, Inc.
Henry Valve Co.
Pressure Products Industries

SACCHARIMETERS
Aloe Co., A. S.
Bausch & Lomb Opt.
Brinkmann Instruments
Central Scientific Co.
Fish-Schurman Corp.
Griebel Co.
Jarrell-Ash Co.
Kimble Glass
Moeller Instrument Co.
Opplem Co.
Precision Thermometer
Rieker Inst. Co.
Rudolph & Sons
Sargent & Co., E. H.
Scientific Inst. Co.
Trerice Co.
Weksler Thermometer
Zeiss Inc., Carl

SACCHAROMETERS
Central Scientific Co.
Fish-Schurman Corp.
Fleischauer & Son
Griebel Co.
G. M. Mfg. Co., Inc.
H. B. Inst. Co.
Kimble Glass Co.
Moeller Instrument Co.
Precision Therm. & Inst.
Rascher & Betzold
Rieker Inst. Co.
Ruehfel Co.
Scientific Inst. Co.
Taylor Inst. Cos.
Testrite Instrument Co.
Trerice. Co.
Wagner & Son
Weksler Thermometer
Weston Elec. Inst.

SAFETY DISKS (See Rupture Disks)

SALINITY INDICATORS
Central Scientific Co.
Engineering Labs., Inc.
Fielden Instrument
Fleischauer & Son
Foxboro Co.
Gerin Corp.
G.M. Mfg. Co., Inc.
Griebel Co.
H-B Inst. Co.
I-L-S Instrument
Industrial Insts., Inc.
Instrument Lab.
J-B-L Instrument
Kahl Scientific Inst.
Leeds & Northrup Co.
Moeller Inst. Co.
Precision Therm. & Inst.
Rascher & Betzold
Rubicon Co.
Ruehfel Co.
Scientific Inst. Co.
Taylor Inst. Cos.
Thwing Albert Inst. Co.
Trerice Co.
Wagner & Son
Weksler Thermometer
Westinghouse Elec.
Weston Elec. Inst.

SALINOMETERS (See Salinity Indicators)

SAMPLERS, Boiler Water
Hagan Corp.
Lapp Insulator
Milton Roy Co.
Parker Appliance
Weston Elec. Inst.

SAMPLERS, Oil
Bowser Inc.
Braun Corp.
Central Scientific Co.
Gilbert & Barker Mfg. Co.
G. M. Mfg. Co.
Hoke, Inc.
Johnston & Jennings Co.
Koehler Instrument Co., Inc.
Labline, Inc.
Milton Roy Co.
Precision Scientific
Proportioners, Inc.
Refinery Supply Co.
Scientific Glass Apparatus
Shand & Jurs
Vapor Recovery Systems

SAMPLERS, Oil Bottomhole
Coleman Inst. Co.
Geotechnical Corp.
G. M. Mfg. Co.
Hoke, Inc.
Labline, Inc.
Precision Scientific
Ruska Inst. Corp.

SAMPLERS, Peat and Marl
Eberbach Corp.

G. M. Mfg. Co.
Soiltest Inc.

SAMPLERS, Sewage
Builders-Providence
Central Scientific Co.
DeZurik Shower Co.
G. M. Mfg. Co.
Labline, Inc.
Milton Roy Co.
Precision Scientific
Proportioneers, Inc.
Scientific Glass Apparatus
Thwing-Albert Inst.

SAMPLERS, Silt
Central Scientific Co.
G. M. Mfg. Co.
Instruments Corp.
Leupold & Stevens
Milton Roy Co.
Soiltest Inc.

SAMPLERS, Snow
Leupold & Stevens

SCALER, Geiger Muller (See Counters, Geiger Muller)

SCALES (See object of Measurement and Control)

SCALES, Antimony Test
Howe Scale Co.
Seederer-Kohlbusch, Inc.
Troemner, Henry

SCALES, Automatic
Arga Div.
Automatic Scale Co.
Baldwin-Lima-Hamilton
Buffalo Scale Co.
Chatillon & Sons
Dillon & Co., W. C.
Exact Weight Scale
Fairbanks, Morse & Co.
Gilmore Industries
Hadley Assoc.
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co., Inc.
Maxson Corp., W. L.
Merrick Scale Mfg. Co.
Monsell, J. R.
Porter, George K.
Revere Corp.
Richardson Scale Co.
Rockwell Eng'ng
Schaffer Poidometer Co.
Seedboro Equipment
Streeter-Amet Co.
Thayer Scale & Eng'ng.
Toledo Scale Co.
Triner Scale & Mfg.
Wallace & Tiernan
Weighing Components

SCALES, Bag Filling
Automatic Scale Co.
Detecto Scales
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Hadley Assoc.
Howe Scale Co.
Jacobs Bros. Co.
Richardson Scale Co.
Seedburo Equipment
Thayer Scale & Eng'ng.
Toledo Scale Co.
Weighing Components

SCALES, Basis Weight
Amthor Testing Inst. Co.
Becker Div., Christian
Buffalo Scale Co.
Cady & Co., E. J.
Chatillon & Sons
Dillon & Co., W. C.
Exact Scale Co.
Gilmore Industries
Hadley Assoc.
Howe Scale Co.
Richardson Scale
Seederer-Kohlbusch
Streeter-Amet Co.
Testing Machines, Inc.
Thayer Scales & Eng'ng.
Thwing-Albert Instrument
Toledo Scale Co.
Triner Sales Co.

SCALES, Bulk Weighing
Automatic Scale
Baldwin-Lima-Hamilton
Becker Div., Christian
Buffalo Scale Co.
Chatillon & Sons
Conoflow Corp.
Detecto Scales
Dillon & Co., W. C.
Emery Co., A. H.
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gilmore Industries
Hadley Assoc.
Howe Scale Co.
Jacobs Bros. Co.
Merrick Scale Mfg.
Monsell, J. R.
Revere Corp.
Richardson Scale Co.
Ruge-de Forest Inc.
Schaffer Poidometer Co.
Streeter-Amet Co.
Testing Machines, Inc.
Thayer Scale & Eng'ng.
Toledo Scale Co.
Triangle Package Mach.
Triner Sales Co.
Troemner, Henry
Weighing Components.

SCALES, Cement Batching
Buffalo Scale Co.
Chatillon & Sons
Detecto Scales
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gilmore Industries
Howe Scale Co.
Merrick Scale & Mfg.
Richardson Scale Co.
Streeter-Amet Co.
Thayer Scale & Eng'ng.
Toledo Scale Co.
Triner Scale & Mfg.
Weighing Components

SCALES, Checking
Becker Div., Chritsian
Buffalo Scale Co.
Chatillon & Sons
Detecto Scales
Exact Weight Scale Co.
Fairbanks, Morse & Co.
Gilmore Industries
G. M. Mfg. Co.
Hadley Assoc.
Howe Scale Co.
Jacobs Bros. Co., Inc.
Merrick Scale Mfg. Co.
Hadley Assoc.
Jacobs Bros. Co., Inc.
Merrick Scale Mfg. Co.
Richardson Scale Co.
Seederer-Kohlbusch
Streeter-Amet Co.
Thayer Scale & Eng'ng
Toledo Scale Co.
Torsion Balance Co.
Triner Scale & Mfg.
Weighing Components

SCALES, Classifying
Buffalo Scale Co.
Chatillon & Sons
Exact Weight Scale Co.
Gilmore Industries
Howe Scale Co.
Jacobs Bros., Inc.
Merrick Scale Mfg. Co.
Thayer Scale & Eng'ng.
Toledo Scale Co.
Triner Scale Co.
Weighing Components

SCALES, Computing
Amthor Testing Inst.
Buffalo Scale Co.
Detecto Scales
Exact Weight Scale
Gilmore Industries
Howe Scale Co.
International Bus. Mach.
Jacobs Bros. Co.
Monsell, J. R.
Seederer-Kohlbusch
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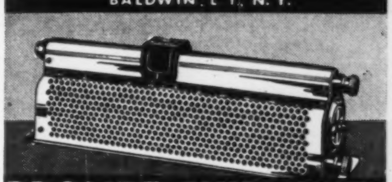
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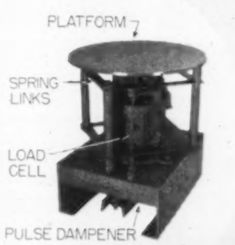

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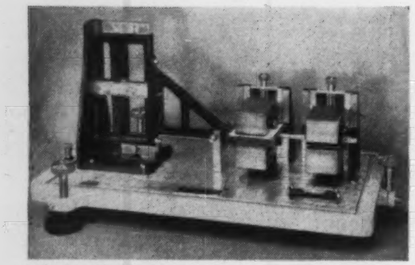

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Troemner, Henry

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Taller & Cooper
Thayer Scale & Eng'ng.
Toledo Scale Co.
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Howe Scale Co.
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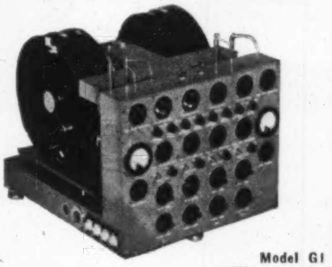

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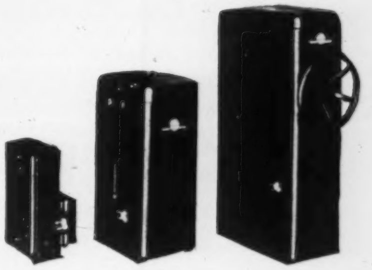

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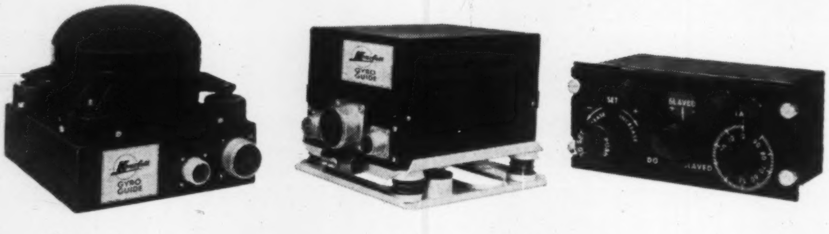

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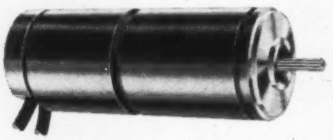

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High torque, low inertia Servo motors, Servo-motor-Generators, inertial and viscous damped Servo motors 3/4" to 1-3/4" diameter, Synchro Transmitters, Control Transformers, Resolvers, Repeaters and Differentials in size 8, 11 and 15.

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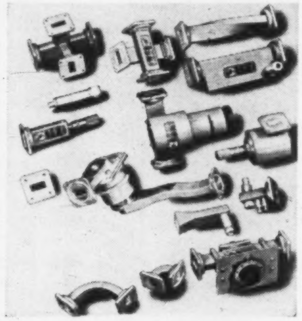
Kearfott offers engineering-design service, manufacturing facilities and a wide experience in the production of microwave components and test sets.



COMPONENTS

Including attenuators, directional couplers, crystal mixers, twists and tees for S, C, Xb, X and Ku bands.

TEST SETS (for X, C, and Ku)

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South Central Office: 6115 Denton Drive, Dallas, Texas
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WESTERN MANUFACTURING DIVISION:
14844 Oxnard Street, Van Nuys, Calif.

Kearfott

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Hansen Mfg. Co.
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Instr. Associates
Instrument Motors Co.
International Std. Trading
Kearfott Co.
Kinetix Inst. Div.
Kollsman Instrument
L.A.B. Corp.
Lear, Inc.
Lectronic Res. Labs.
Leeds & Northrup Corp.
Martin-Hubbard Corp.
Maxson Corp.
Minneapolis-Honeywell
Moseley, Francis L.
Norden-Ketay Corp.
Oster Mfg., John
Pacific Scientific
Phoenix Precision Inst.
Raytheon Mfg.
Reeves Instrument
Robinette Co., W. C.
Sangamo Electric
Schwien Engg.
Servo Corp. of America
Servomechanisms, Inc.
Servo-Tek Products
Shallcross Controls
Small Motors
Sperry Gyroscope Co.
Summers Gyroscope
Transcoil Corp.
Western Gear
Wilson & Co.

SERVOMOTORS, Electric Solenoid
Bendix Aviation Corp.
Bill Jack Scientific
Bristol Co.
Burton Mfg.
Clark Cooper Co.
Daystrom Inst.
Instrument Dev. Labs.
Kearfott Co.
Kollsman Instrument
Martin-Hubbard Corp.
Midwestern Instruments
Schwien Eng. Co.
Servo Corp. of Amer.
Shallcross Controls
Summers Gyroscope
Weighing Components

SERVOMOTORS, Hydraulic
Askania Regulator Co.
Bailey Meter Co.
Bendix Aviation Corp.
Burton Mfg.
Dennison Engineering
General Electric
General Regulator Corp.
Hagan Corp.
Hydraulic Controls Co.
Kearfott Co.
Martin-Hubbard Corp.
Mason-Neilan Regulator
Maxson Corp.
Midwestern Instruments
Republic Flow Meters
Servo Corp. of Amer.
Shallcross Controls
Standard Controls, Inc.
Vickers, Inc.
Weighing Components

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Air Associates
AiResearch Mfg.
Airflo Instrument Co.
Bristol Co.
Burton Mfg.
Doelcam Div.
Foxboro Co.
Hagan Corp.
Humphrey Inc.
Hydraulic Controls Co.
Kearfott Co.
Kinetix Inst. Div.
Lears, Inc.
Martin-Hubbard Corp.
Servo Corp. of America
Servomechanisms, Inc.
Shallcross Controls
Summers Gyroscope

SERVOMOTORS, Pneumatic
AiResearch Mfg.
Askania Regulator Co.
Bailey Meter Co.
Bristol Co.
Burton Mfg.
Emery Co., A. H.
Foxboro Co.
General Regulator
Hagan Corp.
Mason-Neilan Regulator
Maxson Corp.
Minneapolis-Honeywell
Moore Products
Republic Flow Meters
Sangamo Electric
Servo Corp. of Amer.
Shallcross Controls

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Bausch & Lomb Opt.
Bray Optical Co.
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Dusenbery Co.
Eclipse-Pioneer Div.
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Keuffel & Esser Co.
Kollsman Instruments
Leupold & Stevens
Lindly Co.
Link Aviation Devices
Negus, T. S. & J. D.
Suverkop Instruments
Unertl Optical Co.
Warren-Knight Co.
White Co., Inc.

SHAFTING, Flexible
Barbour-Stockwell
Insulin Corp. of Amer.
Lear, Inc.
Stewart Corp.
Teleflex Inc.

SHIP LOGS
Elec. Tachometer Corp.
Kenyon Instrument Co.
Negus, T. S. & J. D.
Nife, Inc.
Pitometer Log Corp.

SHOCK MOUNTINGS (See Mountings)

SHUNT METERS (See Meters, Shunt)

SHUNTS
Associated Research
Audio Instrument
Bradshaw
Burlington Inst. Co.
Columbia Elec. Mfg.
De Jur-Amsco
Electronic Dev. Lab.
Esterline-Angus Co.
GE Apparatus
GE Instrument Dept.
Gray Instrument
Hickok Elec. Inst. Co.
Instrument Resistors, Inc.
International Resistance
Leeds & Northrup
Lewis Engineering
Madison Elec. Prod. Div.
Norton Electrical Inst.
Physics Research
Precision Resistor Co.
Radio City Products Co.
Rawson Electrical Inst.
Reiner Electronics
Roller-Smith Co.
Rubicon Co.
Sangamo Electric
Sensitive Research Inst.
Shallcross Mfg.
Standard Science Sup.
Simpson Electric Co.
Sittler Corp.
Stewart-Warner
Sun Manufacturing
Triplett Electrical Inst.
United Optical Mfg.
Waveforms, Inc.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

SHUNTS, Standard
Associated Research
Burlington Instrument
Cambridge Instrument Co.
De Jur-Amsco
Electronic Dev. Lab.
General Electric Co.
Gray Instrument Co.
Hickok Electrical Inst.
Instrument Resistors Co.
International Resistance
Leeds & Northrup Co.
Lewis Engineering
Physics Research
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg.
Sittler Corp.
Triplett Elec. Inst. Co.
United Optical Mfg.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

SIEVE SHAKERS
American Inst. Co.
Braun Corp.
Central Scientific
Dietert Co.
Grain Lab Equip.
Gump Co., B. F.
Humboldt Mfg. Co.
La Pine & Co., A. S.
Newark Wire Cloth
Precision Scientific
Refinery Supply Co.
Williams Apparatus

SIEVES, TESTING
American Inst. Co.
Boekel & Co.
Central Scientific Co.
Custom Scientific Insts.,
Dietert Co.
Fisher Scientific Co.
Gordon Co., Claud S.
Grain Lab. Equip.
Humboldt Mfg. Co.
La Pine & Co., A. S.
Newark Wire Cloth
Precision Scientific Co.
Riehle Division
Scientific Inst. Co.
Weber Brothers Metal

SIGHT FEED BUBBLERS
Bailey Meter Co.
Brooks Rotameter
Conoflow Corp.
Fischer & Porter
Foxboro Co.
Industrol Corp.
King Engineering
Meriam Instrument
Moore Products
Uehling Instrument Co.

SIGHT METERS
Brooks Rotameter
De Jur-Amsco
Fischer & Porter
General Elec. Co.
G-M Labs.
International Dev. Co.
Jacoby-Tarbox Corp.
Meyer & Co., Hugo
Triplett Elec. Inst.
Uehling Instrument Co.
Weston Elec. Inst. Corp.

SIGHTS, GUN, Telescopic
Bausch & Lomb Opt.
Bell & Howell Co.
Clark & Sons
Ercona Corp.
Fecker, Inc.
Helio Instrument
International Dev. Co.
Leupold & Stevens
Lindly & Co.
Mann Co., W. I.
Meyer & Co., Hugo
Norden-Ketay Corp.
Perkin-Elmer Co.
Plummer & Kershaw
Testa Mfg. Co.
Tinsley Laboratories
Unertl Optical Co.
Zeiss, Inc., Carl

SIGNAL GENERATORS (See Generators, Signal)

SIGNAL LIGHTS (See also Dial Lights)
Dialight Corp.

SIGNALING DEVICES Automatic
Airborne Instruments
Auth Elec. Spec.
Authorized Mfrs. Service
Autocall Co.
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Temp. Controls
Bailey Meter Co.
Beck & Co.
Betts & Betts
Bristol Co.
Browning Lab.
Bullard Co.
Cal-Tronics Corp.
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Cincinnati Time Rec.
Clark Cooper Co.
Con Ray Corp.
Cook Electric Co.
De-Tec-Tronic Corp.
Eastern Industries
Elec. Indicator Corp.
Fischer & Porter
Foxoro Co.
GE Apparatus Sales
Guardian Elec. Mfg. Co.
Haydon Co., A. W.
Holtzer-Cabot Elec. Co.
Industrial Timer Corp.
International Bus. Mach.
International Std. Trading
Jaidinger Mfg. Co.
Kirkland Co., H. R.
Leslie Co.
Leupold & Stevens
Lumenite Electronic
Magnetrol, Inc.
Martin-Hubbard Co.
Mason-Neilan Regulator
Mine Safety App. Co.
Montgomery Mfg. Co.
National Time & Signal
Nuclear Research
Panellit, Inc.
Phoenix Prec. Inst.
Photoswitch Div.
Production Instrument
Raytheon Mfg. Co.
Rochester Mfg. Co.
Rosen Engg.
SCAM Instrument
Servo Corp. of Amer.
Signal Engr. & Mfg.
Science Engineering Co.
Standard Elec. Time
Thompson Clock Co.
Tigerman Engineering
Union Switch
Viking Instruments
Wallace & Tiernan
Warren Telechron

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Airborne Instruments
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Amglo Corp.
Automatic Elec. Chicago
Automatic Temp. Control
Bullard Co.
Eagle Signal Corp.
Eastern Industries
Emarco Corp.
Flett Lab.
GE Apparatus Sales
National Time & Signal
Photoswitch, Inc.
Rea Co., J. B.
Sangamo Electric Co.

SILICA, VITREOUS
Cooper-Hewitt Elec.
Crystal Research Labs.
Engelhard, Charles
General Electric
Hanovia Chem. & Mfg.
Thermal American Fused
Thermal Syndicate, Ltd.

SINE BARS
DoAll Co.
Herkimer Tool
Jansson Gage Co.
Scherr Co., Inc.
Swedish Gage Co.
Thomas Tool
Vinco Corp.

SLIDE RULES (See Drawing Instruments)

SLIDING GAGES (See Gages, Sliding)

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SAVE SPACE—a direct alignment in remote control or power transmission around corners.

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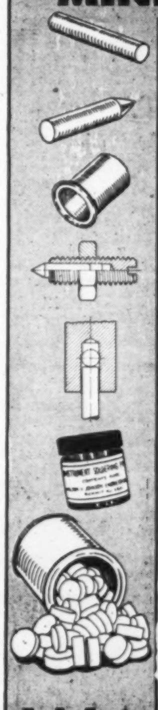
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SERVICES FOR CUSTOMERS' PARTS

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SMOKE INDICATORS
AND RECORDERS

BAILEY
METERS

**BAILEY (Bolometer Type)
SMOKE DENSITY RECORDER**

The Bailey Smoke Density Recorder can help you erase smoke troubles. It quickly reveals inefficient operating conditions and provides 24-hour continuous records for later study.

Both light source and Bolometer are of sealed beam construction to assure long, accurate life. This unique smoke detector is not affected by high ambient temperatures or corrosive gases. It needs no cooling devices.

For information on how Bailey can help erase your Smoke troubles write for Bulletin #211 "Bailey Smoke Density Recorder."

Smoke Density Recorder

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND 10, OHIO

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SLIP RINGS
American Inst. Corp.
Electro Development Corp.
Inst. Dev. & Mfg. Corp.
Lear, Inc.
P-M Industries
Polyphase Instrument Co.
Schaevitz Engg.
Telex, Inc.

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Annis Co.
Bell & Howell Co.
Berndt-Bach, Inc.
Bill Jack Scientific
Bolsey Corp.
Boulin Instrument Corp.
Commercial Engg. Labs.
General Radio Co.
Ercona Corp.
Gordon Enterprises
Hycon Mfg. Co.
Telechron Dept.
Wollensak Optical

SLUMP CONES (See Cones, Slump)

SMOKE DENSITY INDICATORS & RECORDERS
Airdesign, Inc.
Associated Research
Bacharach Ind. Inst. Co.
Bailey Meter Co.
Bristol Co.
Brooke Engineering
Cleveland Fuel
Combustion Control
Denver Fire Clay Co.
De-Tec-Tronic Corp.
Diatron Co.
Dickson Co.
Edwards, L. V.
Electronic Control
Electronic Lab.
Electronics Corp. of Am.
Electron-Radar Prod.
Ess Instrument Co.
GE Apparatus Sales
General Television Corp.
Instrument Dev. Labs.
International Std. Trading
Kewaunee Mfg.
Larson Instrument
Leeds & Northrup Co.
Lumenite Elec.
McNeill Engineering
Mine Safety
Phoenix Prec. Inst.
Photovolt Corp.
Preferred Utilities Mfg.
Refinery Supply
Rockwell Engr. Co.
Standard Instrument
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Weston Elec. Inst. Corp.
Williams, Brown & Earle
Worner Electronics

SMOOTHNESS RECORDERS (See Surface Finish Analyzers)

SOLAR PROJECTING SCREENS (See Screens, Solar Projecting)

SOLDERING IRONS
Electrical Soldering
G E Apparatus Sales
Hexacon Electrical
Newage International
Stafford Co.
Weller Elec. Corp.

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Allen-Bradley Co.
Automatic Elec. Chicago
Automatic Switch Co.
B. W. Controller
Cannon Electric
Carruthers & Fernandez
Comar Elec. Co.
Corbett Science Labs.
Cutler-Hammer, Inc.
Dalmotor Co.
Daystrom Inst.
Dittmore & Freimuth
Electro Devices, Inc.
Electrical Facilities
G E Apparatus Sales
Guardian Elec. Mfg.
Huggins Labs.
Kahn & Co.
Lee Spring Co.
Leland, Inc., G. H.
Moran Electronic
Phillips Control
Pollak Corp.
Synchro-Start Products
Tartak Electronics
United States Eectronics
West Coast Electrical

SOUND DETECTORS (See Detectors, Sound)

SOUND INDICATORS & ANALYZERS (See Indicators, Sound & Analyzers, Sound)

SOUND LEVEL METERS
Aerovox Corp.
Amplifier Co.
Assembly Products
Audio Development
Audio-Tone Oscillator
Ballantine Labs, Inc.
Beede Elec. Inst. Co.
Bristol Eng'ng
Brush Electronics Co.
Burlington Inst. Co.
Clough-Brengle Co.
Columbus Products Corp.
Computer Co., of America
Dale Instruments
Daven Co.
De Jur-Amsco Corp.
Dittmore & Freimuth
Dyna Labs
Electric Des. & Mfg.
Electro-Tech Equipmnet
Electronic Development
Electronic Instrument
Erwood Co.
Federal Telephone
Feiler Engineering
General Elec. Co.
General Radio Co.
Hickok Elec. Inst.
International Instruments
Kay Electric Co.
Marconi Inst.
Marion Elec. Inst.
Massa Labs.
Meters, Inc.
Mine Safety Appliances
Phaostron Co.
Precision Apparatus Corp.
Radio City Products
RCA Div.
Scott, Inc., Hermon
Shallcross Mfg. Co.
Sherron Metallic
Simpson Electric
Sound Apparatus Co.
Techno Inst.
Triplett Electric Inst.
United Optical Mfg.
Viking Instruments
Westinghouse Elec.
Weston Elec. Inst. Corp.

SOUNDING LEADS
Bliss & Co.
G. M. Mfg. Co.
Kenyon Instruments
Moeller Instrument Co.
Negus, T. S. & J. D.

SOUNDING MACHINES
Garlynn Eng'ng
G. M. Mfg. Co.
Hand & Sons
Kenyon Instrument Co.
Moeller Instrument Co.
Negus, T. S. & J. D.

SOUNDING TUBES
Kimble Glass Co.
Leupold & Stevens
Moeller Instrument Co.
Negus, T. S. & J. D.

SPECIFIC GRAVITY INDICATORS & RECORDERS (See Gravity)

SPECTRA DEMONSTRATORS
Todd Scientific

SPECTRAL TUBES CONTAINING RARE GASES (See Spectrum Tubes)

SPECTROGRAPHS
Applied Research Labs.
Baird Associates
Bausch & Lomb Optical
Beva Laboratory
Biddle Co., James G.
Brinkmann Instrument
Central Scientific
Consolidated Engr.
Ercona Corp.
Farrand Optical
Fecker, Inc.
Gaertner Scientific Corp.
Griswold Mfg. Co.
Henson Co., Fred C.
Jarrell-Ash
Kay Electric
National Spectrographic
Perkin-Elmer
Precise Measurements Co.
Scientific Specialties
Spencer Lens Co.
Unertl Optical Co.
Zeiss, Inc., Carl

SPECTROGRAPHS, Diffraction Grating
Applied Research Labs
Baird Associates
Bausch & Lomb Optical
Central Scientific
Ercona Corp.
Jarrell-Ash Co.
National Spectrographic

SPECTROGRAPHS, Mass
Atomic Research Corp.
Berkeley Scientific
Consolidated Engr.
Furst Electronics
General Electric Co.
Griswold Mfg. Co.
Manson Labs.
Process & Instruments
Phoenix Precision Insts.
Skaneateles Mfg. Co.

SPECTROGRAPHS, Oscillating
General Elec. Co.
Hayes Scientific App.
Perkin-Elmer
Unertl Optical Co.

SPECTROGRAPHS, Raman
Applied Physics Corp.
Applied Research Labs
Brinkmann Instrument
Griswold Mfg. Co.
Jarrell-Ash Co.
Perkin-Elmer

SPECTROGRAPHS, Vacuum
Applied Research Labs.
Baird Associates
Biddle Co., James G.
Central Scientific Co.
Dietert Co.
Farrand Optical
Fecker, J. W.
Jarrell-Ash Co.
Skaneateles Mfg. Co.
Thomas Co., Arthur H.
Unertl Optical Co.

SPECTROGRAPHS, X-ray
Applied Research Labs.
Beva Laboratory
Biddle Co., James G.
Central Scientific Co.
Gaertner Scientific
G E Apparatus Sales
General Elec. X-Ray Dept.
Hayes Scientific App.
Henson Co., Fred C.
Jarrell-Ash Co.
Kelley-Koett Mfg.
North Amer. Phillips
Unertl Optical Co.
Victoreen Instrument Co.
Wyland, G. C.

SPECTROMETERS
American Optical
Applied Physics
Applied Research Labs.
Atomic Instrument
Baird Associates
Bausch & Lomb Optical
Beckman Instruments
Beva Laboratory
Biddle Co., James G.
Consolidated Engg.
Davidson Mfg. Co.
Dearborn Scientific
Farrand Optical Co.
Gaertner Scientific Corp.
General Electric
Jarrell-Ash Co.
Leeds & Northrup
Martin-Hubbard Corp.
Meyer & Co., Hugo
National Instrument
Opplem Co., Inc.
Perkin-Elmer Corp.
Precise Measurements
Rudolph & Sons
Unertl Optical Co.
Varian Associates
Welch Scientific
Wild Heerbrugg Insts.

SPECTROMETERS, Infrared
Avion Div.
Baird Associates
Beckman Instruments
Consolidated Engg.
Farrand Optical
Gaertner Scientific Corp.
General Elec. Co.
Jarrell-Ash Co.
Leeds & Northrup
Marconi Insts.
Perkin-Elmer Corp.
Pfaltz & Bauer
Phoenix Prec. Inst.

SPECTROMETERS, Recording, Mass
Avion Div.
Beckman Instruments
Berkley Scientific
Biddle Co., James G.
Consolidated Engg.
Furst Electronics
General Elec. Co.
Process & Instruments
Unertl Optical Co.
Varian Associates

SPECTROMETERS, X-RAY (See Spectrograph, X-Ray)

SPECTRO-PHOTOMETERS (See Photometers, Spectro)

SPECTROPHOTOMETERS, Ultra-Violet
Applied Physics Corp.
Beckman Instruments
Farrand Optical
General Elec. Co.
Jarrell-Ash Co.
Librascope
Perkin-Elmer
Phoenix Precision Inst.
Process & Instruments
Warren Electronics, Inc.
Zeiss, Inc., Carl

SPECTROSCOPES
American Optical
Bausch & Lomb Opt.
Brinkmann Instruments
Central Scientific Co.
Dearborn Scientific
Edmund Scientific
Ercona Corp.
Fecker, Inc.
Fish-Schurman Corp.
Gaertner Scientific Corp.
General Elect. X-Ray
Griswold Mfg. Co.
Hacker & Co., W. J.
Jarrell-Ash Co.
Laboratory Optical
Laboratory Specialties
Leitz, Inc.
Meyer & Co., Hugo
National Spectrographic
Pfaltz & Bauer, Inc.
Precise Measurements Co.
Rudolph & Sons
Todd Scientific
Unertl Optical Co.
Welch Scientific
Zeiss, Inc., Carl

SPECTROSCOPES, Quartz
Gaertner Scientific Corp.
Laboratory Optical
Precise Measurements Co.
Thermal American Fused
Unertl Optical Co.

SPECTROSCOPES, Stellar
American Optical Co.
Central Scientific Co.
Eastern Scientific Co.
Ercona Corp.
Fecker, Inc.
Laboratory Optical
Mico Instrument Co.
Perkins-Elmer Corp.
Unertl Optical Co.
Zeiss, Inc., Carl

SPECTRUM TUBES
Central Scientific Co.
Electronic Products
Gaertner Scientific Corp.
General Physical Lab.
Jarrell-Ash Co.
Skaneateles Mfg. Co.

SPEED, Indicators
Aeromarine Instrument
American Chronoscope
Amthor Testing Inst. Co.
Associated Research
Automatic Elec. Chicago
Bailey Meter Co.
Barber Colman
Barbour-Stockwell
Beckman & Whitley
Bendix Aviation Corp.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Bristol Co.
Brown & Sharpe
Builders-Providence
Chicago Elec. Tachometer
Cincinnati Time Rec.
Commercial Research
Control Engr. Co.
Cramer & Co., Inc.
Electric-Speed Ind. Co.
Elec. Tachometer Corp.
Electrical Develop.
Electro-Mechano Co.
Elgin National Watch
Engineering Res. Dev.
Esterline-Angus Co.
Fielden Instrument
Foxboro Co.
Gaertner Scientific Corp.
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Hathaway Inst. Co.
Hewlett-Packard
Hickok Elec. Inst. Co.
Howell Instrument
Instrument Dev. Labs.
Jaeger Watch Co.
Jones-Motorola
Kay Electric
Leeds & Northrup Co.
Manning, Maxwell & Moore
Marx, Clarence J.
Matisa Equipment
McDonnell Odometer Co.
Metron Instrument Co.
Minneapolis-Honeywell
Moisture Register Co.
Norden-Ketay Corp.
Potter Instrument
Precision Therm.
Presin Co.
Raytheon Mfg. Co.
Reliance Electric & Eng'ng
Roller-Smith
Sangamo Electric Co.
Scherr Co., Inc.
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Standard Elec. Time
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Sunshine Scientific
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Triplett Elec. Inst.
U. S. Taximeter
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Walkirt Co.
Westberg Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Westport Electric
Zernickow Co., O.

SPEED RECORDERS (See Speed Indicators)

SPEED REGULATORS (See Controllers, Automatic, Tachometric)

SPEED SYNCHRONIZING INDICATORS
Control Engr. Co.
Electric Speed Ind. Co.
Electric Tachometer
General Elec. Co.
Norden-Ketay Corp.
Potter Instrument
Scherr Co., Inc.
Westberg Mfg. Co.

SPEEDOMETERS
Barbour-Stockwell
Boulin Instrument Corp.
Central Scientific
Commercial Research
Corbin Screw Corp.
Cramer & Co., Inc.
Electric Auto-Lite
Elec. Tachometer Corp.
Electronic Associates
Engineering Res. & Dev.
GE Apparatus Sales
GE Instrument Dept.
Jones-Motorola
Matisa Equipment
Scherr Co., Inc.
Standard Elec. Time
Stewart-Warner Corp.
Tracktest Equipment Co.
Westinghouse Elec.

SPHEROMETERS
Engis Equipment
Epic, Inc.
Gaertner Scientific
Helio Instrument
Mann Co., W. I.
Penn Optical & Inst.

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G. M. Mfg. Co.
Hellige, Inc.
Precision Thermometer
Stoelting Co., C. H.
Taylor Inst. Cos.

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Brown & Sharpe
DoAll Co.
Jansson Gage Co.
Lufkin Rule Co.
Mico Instrument Co.
Millers Falls
Scherr Co., Inc.
Starrett Co.
Thomas Tool
Warren-Knight Co.

STANDARD CELLS (See Cells, Standard)

STANDARDS, Acoustic
Massa Laboratories

STANDARDS, Capacitance
Aeovox Corp.
Brown Electro-Measurement
Cambridge Inst. Co.
Federal Telephone & Radio
General Radio Co.
Industrial Instruments
Leeds & Northrup Co.
MacLeod & Hanopol
Pacific Instruments
Rubicon Co.
Scientific Specialties
Solar Mfg. Corp.
United Condenser

STANDARDS, Color
E & S Optical
Fish-Schurman Co.
Gardner Lab.
Hellige, Inc.
Munsell Color Co.
Phoenix Precision Inst.

Taylor & Co., W. A.
Weston Elec. Inst.

STANDARDS, E.m.f.
Cambridge Inst. Co.
Doelcam Div.
Kahn & Co.
Kay-Lab.
Leeds & Northrup Co.
Gray Instrument
Rubicon Co.

STANDARDS, Frequency
American Inst. Co.
American Time Prods.
Berkeley Scientific
Boonton Radio Corp.
Browning Laboratories
Central Scientific
Crystal Research Labs.
El Mec Laboratories
Espey Mfg.
Federal Telephone
Feiler Engineering
Ferris Inst. Co.
Freed Transformer
General Electric Co.
General Radio Co.
Gertsch Products
Hamilton Watch
Hewlett-Packard Co.
Howell Instrument
Industrial Test Equip.
Kearfott Co.
Lavoie Laboratories
MacLeod & Hanopol
Marconi Inst.
Measurements Corp.
Millen Mfg. Co.
New London Inst. Co.
Philamon Labs.
Polytechnic Res. & Dev.
Potter Instrument
RCA Div.
Riverbank Laboratories
Servo Corp. of Amer.
Sherron Metallic
Standard Elec. Time
Sunshine Scientific
Telechron Dept.
Teletronics Lab
Times Facsimile Corp.
Varo Mfg. Co.
Vectron, Inc.
Walkirt Co.

STANDARDS, Gamma Ray (See Standards, radio-activity)

STANDARDS, Inductance
Boonton Radio Corp.
Cambridge Inst. Co.
Freed Transformer
General Radio Co.
Leeds & Northrup Co.
Pacific Instrument
Rubicon Co.
Scherr Co., Inc.
Teletronics Lab
United Transformer Corp.

STANDARDS, Length
Acme Industrial
Gaertner Scientific
Griswold Mfg.Co.
Gurley, W. & L. E.
Pratt & Whitney
Renick Co.
Scherr Co., Inc.
Sheffield Corp.
Size Control Co.
Starrett Co., L. S.
Swedish Gage Co.
Van Keuren Co.
Webber Gage Co.

STANDARDS, Mass
Gurley, W. & L. E.
Seederer-Kohlbusch, Inc.

STANDARDS, Potential
Kepco Labs.
Leeds & Northrup Co.
Rubicon Co.
Sensitive Research Inst.

STANDARDS, Pressure
Coleman Inst. Co.
Doelcam Div.
Green, Henry J.
Ideal Lab. Tool
Meriam Inst. Co.
Precision Therm.
Wallace & Tiernan

STANDARDS, Radio-activity
Anton Electronic Labs.
Atomic Instrument
Bio-Rad Labs.
Canadian Radium
El-Tronics, Inc.
Jordan Electronics
Landsverk Electrometer
Menlo Research Lab.
Nucleonic Corp.
Pacific Transducer
R-C Scientific
Technical Associates
Tracerlab
U. S. Radium Corp.
Universal Atomics
Western Radiation

STANDARDS, Resistance
Arnhold Ceramics Inc.
Associated Research
Beck Bros.
Cambridge Inst. Co.
Cutler-Hammer, Inc.
Daven Co.
Eastern Precision Resistor
Electro-Mec Lab.
Federal Instrument
Federal Telephone
General Radio Co.
Gray Instrument
Hardwick, Hindle, Inc.
Industrial Inst. Inc.
Instruments Resistors Co.
International Resistance
Kahn & Co.
Leeds & Northrup Co.
Massa Labs.
Mepco
Physics Research
RCA Div.
Reon Resistor Corp.
Resistance Products Co.
Rubicon Co.
Scientific Specialties
Sensitive Research Inst.
Shallcross Mfg. Co.
Sticht & Co.
United Optical Mfg.
Victoreen Instrument Co.
Ward Leonard Elec. Co.
Audio Tone Oscillator
Dyna Labs.
General Radio
Kay Electric
Massa Laboratories

STANDARDS, Sound Level
Daven Co.
Dyna Labs.
General Radio
Kay Electric
Massa Laboratories

STANDARDS, Surface Roughness
Acme Industrial Co.
Baird Associates
Blake Co., Edward
Brush Electronics
DoAll Co.
Engis Equipment
General Electric
Scherr Co., Inc.
Surface Checking Gage

STANDARDS, Temperature
Ever Ready Thermometer
Green, Henry J.
H-B Instrument
Leeds & Northrup Co.
Lewis Engg.
L & O Research
Moeller Instrument Co.
Precision Therm.
Revere Co.
Weiler Instrument
Weston Elec. Inst.

STANDARDS, Time
American Inst.Co .
American Time Prods.
General Radio Co.
Hamilton Watch
Lavoie Laboratories
Moeller Instrument
Potter Instrument
Rutherford Electronic
Standard Elec. Time Co.
Stewart Instrument
Stoelting Co., C. H.
Varo Mfg. Co.
Vectron, Inc.

STANDARDS, Tuning Fork Frequency
American Time Products
Central Scientific
General Radio
I-L-S Instrument
Industrial Test Equip.
Marconi Instruments Ltd.
McShan Dev. Corp.
Philamon Labs.
Riverbank Labs.
Standard Elec. Time
Sunshine Scientific
Times Facsimile
Varo Mfg. Co.

STANDARDS, Volume
Gurley, V. & L. E.
Kontes Glass Co.

STARTERS, Motor
Allen-Bradley Co.
American-Kloeckner
B. W. Controller
Clark Controller Co.
Cutler-Hammer Inc.
Cyclohm Div.
Furnas Electric
GE Apparatus Sales
Ingersoll-Rand Co.
Minneapolis-Honeywell
Perkin Engineering
Raytheon Mfg. Co.
Schauer Mfg. Co.
Small Motors, Inc.
Square D Co.
Synchro-Start
Westinghouse Elec.

STATIC ELIMINATORS
C. G. S. Labs
Hewson Co.
Sela Electronics Co.
Sticht Co., Herman H.
Superex Electronics Corp.

STATION CONTROL EQUIPMENT
American Meter Co.
Arca Regulators Inc.
Builders-Providence
Continental Electric
Control Corp.
Elec. Indicator Corp.
Feedback Controls
Fischer & Porter
GE Apparatus Sales
RCA Manufacturing
Sherron Metallic
Westinghouse Elec.

STEAM METERS (See Flow Meter, Steam)

STEEL TAPES (See Tapes, Steel)

STELLAR SPECTROSCOPES (See Spectroscopes, Stellar)

STEREOSCOPES
Abrams Instrument
American Optical Co.
Avion Div.
Ercona Corp.
Fairchild Syosset
Flett Lab.
General Biological
Gordon Enterprises
Hacker & Co., W. J.
Meyer & Co., Hugo
Opplem Co., Inc.
Stratex Instrument Co.
Wild Heerbrugg Inst. Co.
Zeiss, Inc., Carl

STEREOSCOPES, X-Ray
Abrams Instrument
Bar-Ray Products, Inc.
Bausch & Lomb Optical
Fairchild Syosset
General Elec. X-Ray Dept.
Kelley-Koett Mfg.Co.
North American Philips
Picker X-Ray
Westinghouse X-Ray Co.

STETHOSCOPES, Engineers
Anco Inst. Div.
Brush Electronics
Engineers Res. & Dev.
Fairchild Camera
Gilmore, E. R.
Zeiss Inc., Carl

STIFFNESS TESTERS, Paper (See Testing Machines, Stiffness)

STILLS, Automatic water
Aetna Scientific
Barnstead Still & Steril.
Central Scientific Co.
Electric Hotpack Co.
Fish-Schurman Co.
General Scientific Equip.
Goetze Niemer
Labline, Inc.
Precision Scientific
Specialty Glass Co.
Stokes Machine Co.
Weber Bros. Metal Works

STIRRERS, Laboratory, Variable Speed
Ace Glass, Inc.
Aloe Co., A. S.
American Inst. Co.
Brookfield Engg. Labs.
Central Scientific Co.
Chicago Surgical & Elec.
Eastern Engg. Co.
Eberbach Corp.
Fish-Schurman Corp.
Fisher-Scientific
Heller Co., G. K.
Humboldt Mfg. Co.
Kontes Glass Co.
Labline, Inc.
La Pine & Co., A. S.
Martin & Co.
Micro-Metric Inst.
Mixing Equipment
Omega Machine
Palo Lab. Supplies
Palo-Myres, Inc.
Phipps & Bird
Precision Scientific
Refinery Supply Co.
Sargent & Co., E. H.
Sorvall, Inc., Ivan
Talbovs Inst. Corp.
Technical Products
Welch Scientific
Western Electric
Wilkens-Anderson

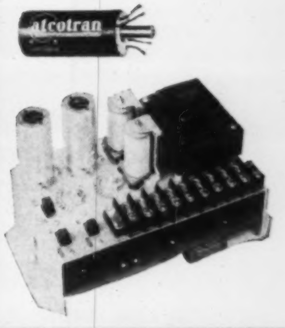
STOP WATCHES (See Watches, Stop)

STRAIGHT EDGES
Acme Industrial
American Meas. Inst.
Brown & Sharpe
Bruning Co., Inc.
Dietzen Co.
Gray Instruments
Griswold Mfg. Co.
Keuffel & Esser Co.
Negus, T. S. & J. D.
Post Co., Frederick
Scherr Co., George
Speidel & Co.
Starrett Co., L. S.
Swedish Gage Co.
Warren-Knight Co.
Webber Gage
Weber Co., F.
White Co., David

STRAIGHTENING VANES
Bailey Meter Co.
Builders Providence
Daniel Orifice Fitting
Foxboro Co.
Hays Corp.
Meriam Inst. Co.
Penn Ind. Inst. Corp.
Republic Flow Meters
Robinson Orifice Fitting
Simplex Valve & Meter
Taylor Instrument Cos.

STRAIN GAGES (See Gages, Strain)

STRAIN TESTERS, Glass (See Testers, Strain Glass)



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ELECTRONIC PRECISION SWITCH

For more information circle **326** on inquiry card.

STRAIN-TIME RECORDERS
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bristol Co.
Brush Electronics
Cambridge Inst. Co.
Consolidated Engineering
Cook Electric Co.
Ellis Associates
Fielden Instrument
Foxboro Co.
Geotechnical Corp.
Gilmore Industries
Hamilton Watch
Hathaway Instrument
Heiland Div.
Keuffel & Esser Co.
Opplem Co.
Rea Co., J. B.
Ruge-de Forest, Inc.
Shasta Div.
Thwing-Albert Inst.

STRAINERS, Pipeline
Anderson Co., V. D.
Black, Sivalls & Bryson
Cash Valve Mfg.
Edward Valves
Fisher Governor Co.
Hays Mfg. Co.
Henry Valve Co.
Leslie Co.
Republic Mfg. Co.
Sarco Company
Schade Valve
Schutte & Koerting Co.

STREAM GAGING INSTRUMENTS
Bristol Co.
Foxboro Co.
Gurley, W. & L. E.
Hathaway Instrument
Keuffel & Esser Co.
Leupold & Stevens
Martin-Hubbard Corp.
Shasta Div.

STRESS INDICATORS
Ames Co., B. C.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Brush Electronics
Cambridge Inst. Co.
Consolidated Engg.
Daytronic Corp.
Dillon & Co., W. C.
Doelcam Div.
DuMont Labs., Inc.
Ellis Associates
Emery Co., A. H.
Federal Products Corp.
General Electric Co.
Gilmore Industries
Hathaway Instrument
Heiland Div.
Industrial Electronics
Kushner Labs.
Magnaflux Corp.
Metron Instrument
Metzger & Son
Minnesota Electronics
Riehle Div.
Ruge-de Forest, Inc.
Shasta Div.
Statham Labs.
Swedish Gage Co.

STRESS-STRAIN ANALYZERS
Electronic Control Sys.
Franklin Electronics
Hathaway Instrument
Moseley Co.
Polyphase Instrument Co.
Westronics, Inc.

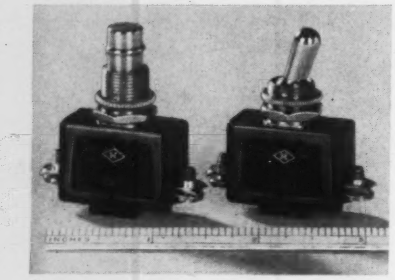
STRESS-STRAIN INDICATORS
Ace Electronics
American Hydromath
Ames Co., B. C.
Anderson, Arthur R.
Ann Arbor Inst. Wks.
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bristol Co.
Brush Electronics
Chatillon & Sons
Consolidated Engg.
Daytronic Corp.
Dillon & Co., W. C.
Doelcam Div.
Electronic Products
Emery Co., A. H.
General Electric
Gilmore Industries
Hathaway Instrument
Heiland Div.
Industrial Electronics
Kybernetes Corp.
Magnaflux Corp.
Metron Instruments
Metzger & Son
Minnesota Electronics
Nosker Eng. Prod.
Olsen Testing Machines
Polyphase Instrument
Scientific Enterprises
Shasta Div.
Sheffield Corp.
Statham Labs.
Swedish Gage Co.
Taller & Cooper
Thwing-Albert Inst.
Trimount Inst. Co.

STRESS-STRAIN RECORDERS
Bailey Meter Co.
Baldwin-Lima Hamilton
Barnes Development
Beckman Instruments
Bristol Co.
Brookfield Engg. Labs.
Brush Electronics
Cambridge Inst. Co.
Century Geophysical
Consolidated Engg.
Cook Electric Co.
Electro Products Labs.
Electronic Products
Emery Co., A. H.
General Electric
Gilmore Industries
Hathaway Instrument
Heiland Div.
Industrial Electronics
Kybernetes Corp.
Metron Instruments
Minnesota Electronics
Moseley, Francis L.
National Forge
Nosker Eng. Prod.
Olsen Testing Machine
Rea Co., J.B.
Riehle Div.
Ruge-de Forest, Inc.
Scott Testers Inc.
Shasta Div.
Sheffield Corp.
Statham Labs.
Streeter-Amet Co.
Taller & Cooper
Thwing-Albert Inst.
Trimount Inst. Co.

STROBOSCOPES
Associated Research
Berkshire Laboratories
Biddle Co., Jas. G.
Boulin Inst. Corp.
Commercial Research
Communication Meas. Lab.
Computer Co. of America
Conn, Ltd., C. G.
Dormitzer Elec. & Mfg.
Edgerton, Germeshausen
Electric Eye Equip.
Electronic Engineers
Electronic Meas. Co.
Endevco Corp.
Engineering Res. & Dev.
Epic, Inc.
Fruengel, Inc.
General Radio Co.
Huggins Labs.
Ideal Laboratory Tool
International Res. & Dev.
Opad Electric
Sylvania Elec. Prod.
Welch Scientific
Westinghouse Elec.
Zeiss, Inc., Carl

SULPHUR BOMBS (See Bombs, Sulphur)

SULPHUR DIOXIDE INDICATORS & RECORD-



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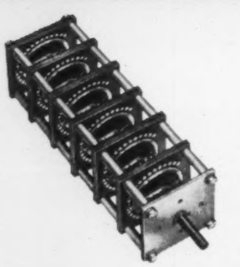

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ERS (See Gas Analyzers, Sulphur Dioxide)

SUN COMPASS
Abrams Instrument
Brunson Instrument
Dusenbury Co.
Georator Corp.

SUNSHINE INDICATORS & RECORDERS
Bristol Co.
Cambridge Inst. Co.
Friez Instrument
General Elect. Co.
G. M. Mfg. Co., Inc.
Instruments Corp.
Leeds & Northrup Co.
Taylor Inst. Co.
White Co., Inc.

SUPERVISORY CONTROL EQUIPMENT & SYSTEMS
Austin Company
Autocall Co.
Automatic Control
Automatic Elec. Chicago
Automatic Switch
Bendix Aviation, Pac. Div.
Bristol Co.
Bristol Eng'ng.
Builders Providence
ConRay Corp.
Control Corp.
Control Eng'ng.
Cramer & Co., Inc.
Detectolab, Inc.
Edison Inc., Thos.
Electromec, Inc.
Electronic Control Systems
Ess Instrument
Feedback Controls
Femco, Inc.
Fielden Instrument
Fischer & Porter
Franklin Electronics
GE Apparatus Sales
GE Instrument Dept.
General Reg. Corp.
Genzlinger, Inc.
Guardian Elec. Mfg.
Hagan Corp.
Hammarlund Mfg. Co.
Industrial Gauges Corp.
Industrial Eng'ng.
International Bus. Mach.
Kybernetes Corp.
Leeds & Northrup Co.
Lesells & Associates
Metrotype Corp.
Minneapolis-Honeywell
North Electric Mfg.
Nuclear Research Corp.
Panellit, Inc.
Phoenix Precision Inst.
Post Machinery Co.
Radio Frequency Labs.
Raytheon Mfg. Co.
SCAM Instrument
Stewart Instrument Co.
Tensitron, Inc.
Ultrasonic Corp.
Viking Instruments
Westinghouse Elec.
Weston Elec. Inst.
Westronics, Inc.
Wickes Engr'g.

SUPPORTS, Cable & Tubing
Air Associates
Arlington Aluminum Co.
Naybor Labs., E. V.
P-W Industries
Rakit Corp.
Weckesser Co.

SURFACE FINISH COMPARATORS (See Comparators, Surface Finish)

SURFACE FINISH SPECIMENS
Acme Industrial
Baird Associates
Blake Co., Edward
Brush Electronics
DoAll Co.
G. E. Apparatus Sales
G. E. Instrument Dept.
Link Eng. & Mfg.
Micrometrical Mfg.
Penn Optical & Inst.
Pipe Machinery
Scherr Co., Inc.
Size Control Co.
Surface Checking Gage
Webber Gage

SURFACE FINISH STANDARDS
Blake Co., Edward
Brush Electronics
Compar Inst. Co.
Engis Equipment
G. E. Apparatus Sales
G. E. Instrument Dept.
Industrial Electronic
Opplem Co.
Pipe Machinery Co.
Scherr Co., Inc.
Surface Checking Gage
Zeiss, Inc., Carl

SURFACE FINISH TESTERS
Paird Associates
Blake Co., Edward
Brush Electronics
Puehler, Adolph I.
Co-Design Corp.
Compar Inst. Co.
Comtor Co.
Engis Equipment
Ercona Corp.
Farrand Optical
Federal Products Corp.
General Elec. Co.
Gurley, W. & L. E.
Industrial Electronics
Link Eng. & Mfg.
Micrometrical Mfg.
Penn Optical & Inst.
Photron Instrument
Scherr Co., Inc.
Sheffield Corp.
Surface Checking Gage Co.
Swedish Gage
Taber Inst. Corp.
Webber Gage
Wilder, R. S.
Williams Apparatus
Williamson Dev.

SURFACE GAGES (See Gages, Surface)

SURFACE PLATES, Glass
Acme Scientific
Bausch & Lomb Optical
Binswanger & Co.
Clark & Sons
Collins Microflat Co.
DoAll Co.
E & S Optical
E & W Optical
Fecker, J. W.
Fish-Schurman Co.
Georator Corp.
Mann Co., Wm. I.
Scherr Co., Inc.
Tinsley Laboratories
Unertl Optical Co.
Zeiss, Inc., Carl

SURFACE PLATES, Stone
Bryant Chucking Grinder
Collins Microflat
DoAll Co.
E & W Optical
Herman Stone Co.
Scherr Co., Inc.
Size Control Co.
Taft-Pierce

SURGE CREST AMMETERS (See Ammeters, Surge-Crest)

SURGE INDICATORS & RECORDINGS
Bristol Co.
Cook Electric
Elec. Indicator Corp.
G. E. Apparatus Sales
Hathaway Instrument
Landis & Gyr.
Sheffield Corp.
Taylor Inst. Cos.

SURVEY FOOT-ODOMETERS (See Odometers)

SURVEYING INSTRUMENTS
Abrams Instrument
Ainsworth & Sons
Alpha Instrument Co.
American Paulin System
Beckman Co.,
Berger & Sons
Bliss & Co.
Bray Optical Co.
Brunning Co., Inc.
Brunson Instrument
Dietzgen Co.
Engis Equipment
Ercona Corp.
Ferner Co.
Garlynn Eng'ng.
Geier & Bluhm
Goldak Co.
Gordon Enterprises
Graf-Apsco
Gurley, W. & L. E.
Hastings Inst. Co.
Hyde Inst.
Jarrel-Ash Co.
Kenyon Instrument Co.
Keuffel & Esser Co.
Leupold & Stevens
Los Angeles Scientific Inst.
Lufkin Rule Co.
Meyer & Co., Hugo
Mikron Instruments
Nuclear-Chicago
Opplem Co., Inc.
Pittsburgh Ins. & Mach.
Post Co., Frederic
Republic Lens Co.
Shepard Labs.
Speedometer Electric Co.
Speidel & Co.
Sperry-Sun Well Survey
Sprengnether Inst.
Starrett Co.
Stratex Instrument Co.
Suverkrop Instruments
Thermometer Corp.
Ulmer Co., J. C.
United States Blue Print
Warren Knight Co.
Weber Co.
White Co., Inc.
Wild Heerbrugg Insts.
Wood Counter Lab.
Zeiss, Inc., Carl.

SURVEYING INSTRUMENTS, Aneroid
American Paulin
Dietzgen Co.
Wallace & Tiernan
Warren-Knight Co.
White Co.
Zeiss, Inc., Carl

SURVEYING INSTRUMENTS, Underground, for wells or bore holes
Anton Electronic Labs.
Berger & Sons
Bruning Co., Inc.
Eastman Oil Well
Engineering Labs., Inc.
Engis Equipment
Georator Corp.
Gurley, W. & L. E.
Halliburton Oil Well
Heiland Research
Jarrell-Ash Co.
Los Angeles Scientific Inst.
Radioactive Products
Sperry-Sun Well Survey
Warren-Knight Co.
White Co.

SURVEYORS' CHAINS (See Surveying Instruments)

SURVEYORS' FOOT METERS
Speedometer Electric Co.
Wild Heerbrugg

SWITCHES, Air Operated
Aeromarine Instrument
Automatic Temp. Control
Barksdale Valves
Black, Sivalls & Bryson
Bristol Co.
Clark Cooper Co.
Climax Div.
Cook Electric
Cutler-Hammer, Inc.
Dietz Co., Henry G.
Dwyer Mfg. Co.
Furnas Electric
Gas Appliance Specialties
General Elec. Co.
Hetherington, Inc.
Hobbs, John W.
Johnson Service Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
Meletron Corp.
Miller-Robinson
Minneapolis-Honeywell
Mu-Switch Corp.
Powers Regulated
Rotron Div.
Seely Instrument
Servonic Instruments
Shallcross Mfg. Co.
Weighing Components
Westinghouse Elec.
Weston Elec. Inst.

SWITCHES, Automatic Transfer
Aero Switch Div.
Allen-Bradley Co.
Allied Control Co.
American Kloeckner
Anderson, A. & J. M.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Control Co.
Automatic Electric Chicago
Automatic Switch Co.
Automatic Temp. Control
Barber-Colman
Cook Electric
Cramer & Co., Inc.
Cutler-Hammer, Inc.
Daven Co.
Daystrom Inst.
Denison Mfg. Co., R. B.
Federal Telephone Co.
G. E. Apparatus Sales
Genisco, Inc.
Hart Mfg. Co.
Haydon Co., A. W.
H-B Instrument
Hetherington, Inc.
International Std. Trading
Jaidinger Mfg. Co.
Lake Erie Electronic Mfg.
Lumenite Electronic
Square D Co.
Walser Automatic Timer
Ward Leonard Elec. Co.
Westinghouse Elec.
Zenith Electric

SWITCHES, Counter-actuating
Anatran Engg.
Clare & Co.
Cook Electric Co.
Daystrom Inst.
Dittmore & Freimuth
Electrical Develop.
Electro-Snap Switch
Electro-Tech Equipment
Endevco Corp.
Farmer Electric Co.
Hetherington, Inc.
International Std. Trading
Jo-Bell Products
Landis & Gyr
Micro Switch
Production Inst.

SWITCHES, Instrument
Acro-Mu Switch Div.
Allard Instrument
Allen-Bradley Co.
Allis-Chalmers
Anatran Engg.
Arizona Ceramics Inc.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Electric Chicago
Automatic Temp. Control
Barber-Colman
Barksdale Valves
Betts & Betts
Brown Electro-Measurement
Carter Parts Co.
Centralab Div.
Cinema Engr.
Cook Electric

Cutler-Hammer, Inc.
Daven Co.
Dittmore & Freimuth
Eastern Precision Resistor
Electro-Snap Switch
Electro Switch
Endevco Corp.
Federal Anti-Capacity
General Cement Mfg.
General Control (Mass.)
G. E. Apparatus Sales
Hart Mfg. Co.
Haydon Switch Co.
H-B Instrument
Hermetic Sealing Corp.
Hetherington, Inc.
Industrial Insts., Inc.
J-B-L Inst. Co.
J-B-T Instruments
Jo-Bell Products
Kellogg Switchboard
Leeds & Northrup Co.
Lewis Engg.
Mack Electric Devices
Mallory & Co.
Manning, Maxwell & Moore
McDonnell & Miller
Mercoid Corp.
Micro Switch Div.
Mossman, Inc.
Norden-Ketay Corp.
Oak Mfg. Co.
Ohmite Mfg. Co.
Pollak Corp.
Roller-Smith
Rubicon Co.
Sensitive Research Co.
Servonic Instruments
Thwing-Albert Instrument
Torsion Balance
Trimount Inst. Co.
Triplett Elec. Inst. Co.
United Optical Mfg.
United States Inst. Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Instrument

SWITCHES, Magnetic

Allen-Bradley Co.
Allied Control Co.
Allis-Chalmers
American Kloeckner
Arizona Ceramics Inc.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Elec. Chicago
Automatic Switch Co.
Automatic Temp. Control
Butler Mfg.
Clare & Co.
Clark Controller Co.
Clark Cooper Co.
Cook Electric
Cutler-Hammer, Inc.
Elgin-Neomatic, Inc.
Furnas Electric
General Cement Mfg.
GE Apparatus Sales
H-B Instrument
Hetherington, Inc.
Jaidinger Mfg. Co.
Jo-Bell Products
Lumenite Electronic
Mack Electric Devices
Mercoid Corp.
Micro Switch Div.
Ohmite Mfg.
Pollak Corp.
Revere Corp.
Ronar, Inc.
Soreng Products
Vickers Elec. Div.
Ward Leonard Elec. Co.
Westinghouse Elec.
Wright Engineering
Zenith Electric

SWITCHES, Mercury

Arizona Ceramics Inc.
Arrow-Hart & Hegeman
Climax Div.
Chatham Electronics
Continental Elec. Co.
Cutler-Hammer, Inc.
Durakool, Inc.
Ebert Electronics
Electric Switch Corp.
Electronic Apparatus
Electro-Tech Equipment
Flett Lab
Fredericks, George
General Cement Mfg.
General Elec. Co.
G. M. Mfg. Co.
H-B Instrument
Kahl Scientific Inst.
Littelfuse, Inc.
Mack Electric Devices
Magnetrol Inc.
McAlear Mfg. Div.
Mercoid Corp.
Mercury Contacts
Micro Switch Div.
Minneapolis-Honeywell
Radiation Counter Labs
Rhodes, Inc.
Ronar, Inc.
Tensitron, Inc.
Tigerman Engineering

SWITCHES, Pressure

Acro-Mu Switch Div.
Aero Instrument Co.
Air Associates
Automatic Control Co.
Barksdale Valves
Black, Sivalls & Bryson
Cook Electric Co.
Dietz Co.
GE Apparatus Sales
Henschel Corp.
Lear, Inc.
Mercoid Corp.
Meletron Corp.
Micro Switch Div.
Miller-Robinson Co.
Minneapolis-Honeywell
Phaostron C.
Riverside Mfg.
Slater Electric
United Electric Controls
Vickers, Inc.
Viking Instruments
Westinghouse Elec.

SWITCHES, Push Button

Acro-Mu Switch Div.
Alden Products
Allen-Bradley Co.
American Kloeckner
Arizona Ceramics Inc.
Automatic Elec. Chicago
Carter Parts Co.
Clare & Co.
Clark Controller
Control Products, Inc.
Cutler-Hammer
Electro-Snap
Furnas Electric
General Control (Mass.)
GE Apparatus Sales
Hart Mfg. Co.
Hetherington, Inc.
Insuline Corp.
Jaidinger Mfg. Co.
Leeds & Northrup
Mallory & Co.
Mercoid Corp.
Micro Switch Div.
Minneapolis-Honeywell
Mossman, Inc., D.P.
Oak Mfg. Co.
Phaostron Co.
Power Equipment Co.
Shallcross Mfg. Co.
Square D Co.
Tigerman Engineering
Westinghouse Elec.

SWITCHES, Pyrometer

Acro-Mu Switch Div.
Arrow-Hart & Hegeman
Bristol Co.
Cutler-Hammer
Daven Co.
Engelhard, Chas.
Foxboro Co.
General Cement Mfg.
GE Apparatus Sales
Gordon Co., Claud S.
J-B-L Instrument
Leeds & Northrup Co.
Lewis Engg Co.
Mack Electric Devices
Minneapolis-Honeywell
Pyrometer Instrument Co.
Revere Corp.
Rowe Engineering
Shallcross Mfg. Co.
Thermo-Electric Co.
Thwing-Albert Inst. Co.
Triplett Elec. Inst.
United States Inst. Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Instruments
Winslow Co.

SWITCHES, Relay

Acro-Mu Switch Div.
Allen-Bradley Co.
Allied Control Co.
American Relay & Controls
Arrow-Hart & Hegeman
Autocall Co.
Automatic Elec. Chicago
Automatic Switch Co.
Automatic Temp. Control
Betts & Betts
Clare & Co., C. P.
Clark & Co.
Clark Controller Co.
Comar Elec. Co.
Cook Electric Co.
Cutler-Hammer, Inc.
Ebert Electronics
Elgin-Neomatic, Inc.
Federal Telephone
Friez Instruments Div.
General Cement Mfg.
General Controls Co.
G. E. Apparatus Sales
Guardian Elec. Mfg. Co.
G-V Controls
Hart Mfg. Co.
H-B Instrument
Hetherington, Inc.
International Std. Trading
Jaidinger Mfg. Co.
Kellogg Switchboard
Kurman Electric
Leland, Inc., G. H.
Mack Electric Devices
Mallory & Co.
Manning, Maxwell & Moore
Mercoid Corp.
Micro Switch Div.
Ohmite Mfg.
Perfex Corp.
Phaostron Co.
Photoswitch Div.
Pollak Corp.
Potter & Brumfield
RCA Div.
Relay Service Co.
Roller-Smith
Skaneateles Mfg. Co.
Square D Co.
Struthers-Dunn
Ward Leonard Elec. Co.
Warrick Co.
Westinghouse Elec.

SWITCHES, Rotary

Allard Instrument
Allen-Bradley Co.
Allied Control Co.
American Kloeckner
Applied Science Corp.
Arizona Ceramics Inc.
Arrow-Hart & Hegeman
Autocall Co.
Automatic Elec. Chicago
Barber-Colman
Bird Electronic
Black, Sivalls & Bryson
Bristol Co.
Brown Electro-Measurement
Cardwell Mfg. Co.
Carter Parts Co.
Centralab Div.
Cinema Engr.
Clare & Co.
Clarostat Mfg. Co.
Consolidated Engr.
Cook Electric Co.
Cutler-Hammer, Inc.
Daven Co.
Daystrom Inst.
Dittmore & Freimuth
Eastern Precision Resistor
Eastern Specialty
Electro Development
ElectroServo Co.
Electro-Snap
Electro Switch
Elgin-Neomatic, Inc.
Farmer Electric Co.
Federal Telephone
Foxboro Company
Furnas Electric
General Cement Mfg.
General Control (Mass.)
General Devices, Inc.
G. E. Apparatus Sales
General Radio Co.
Gray Instrument
Grayhill
Guardian Elec. Mfg. Co.
Hart Mfg. Co.
Haydon Switch
H-B Instrument
Hetherington, Inc.
Insuline Corp.
International Std. Trading
J-B-L Instrument
J-B-T Instruments
Leeds & Northrup Co.
Leland, Inc., G. H.
Lewis Engg. Co.
Mallory & Co.
Micro Switch Div.
Oak Mfg. Co.
Ohmite Mfg. Co.
Photocircuits Corp.
Pollak Corp.
Roller-Smith
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Square D Co.
Thompson Products, Inc.
Thwing-Albert Inst. Co.
Triplett Electrical Inst.
United Optical Mfg.
United States Inst. Corp.
Utah Radio Prods.
Vectron, Inc.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Div.

SWITCHES, Selector

Acro-Mu Switch Div.
Allard Instrument
Allen-Bradley Co.
Allied Control Co.
Allis-Chalmers
American Kloeckner
Anatran Eng'ng.
Arizona Ceramics Inc.
Arrow-Hart & Hegeman
Automatic Elec. Chicago
Barber-Colman
Betts & Betts
Bird Electronic
Bristol Co.
Carter Parts Co.
Centralab Div.
Cinema Engr.
Clare & Co., C. P.
Clark Instrument Co.
Cook Electric
Cutler-Hammer, Inc.
Daven Co.
Dittmore & Freimuth
Electro Switch
Federal Telephone
Foxboro Co.
Furnas Electric
General Cement Mfg.
GE Apparatus Sales
Grayhill
Guardian Electric
Hart Mfg. Co.
H-B Instrument Co.
Hetherington, Inc.
Industrial Instruments
International Std. Trading
J-B-L Instrument
Leeds & Northrup Co.
Lewis Engineering
Mallory & Co.
Meter Devices Co.
Micro Switch Div.
Oak Mfg. Co.
Ohmite Mfg. Co.
Mossman, Inc., D. P.
Phaostron Co.
Photocircuits Corp.
Revere Co.
Shallcross Mfg. Co.
Soreng Products
Square D Co.
Thwing-Albert Inst. Co.
Tigerman Eng'ng.
United States Inst. Corp.
Vapor Recovery Systems
Vectron, Inc.
Ward Leonard
Westinghouse Elec.
Wheelco Div.

SWITCHES, Snap

Acro-Mu Switch Co.
Arizona Ceramics Inc.
Arrow-Hart & Hegeman
Automatic Elec. Chicago
Automatic Temp. Control
Betts & Betts
Channer Corp.
Clark Controller Co.
Clark Cooper Co.
Comar Electric Co.
Control Products, Inc.
Cook Electric Co.
Cutler-Hammer, Inc.
Denison Mfg. Co., R. B.
Electro-Snap
Electro Switch
General Cement Mfg.
General Controls
GE Apparatus Sales
Guardian Electric
Haydon Switch
Hetherington, Inc.
Jaidinger Mfg. Co.
J-B-L Instrument
Jo-Bell Products
Leeds & Northrup
Mallory & Co.
Manning, Maxwell & Moore
McAlear Mfg. Div.
Micro Switch Div.
Minneapolis-Honeywell
Mu-Switch Corp.
Perfex Corp.
Phaostron Co.
Pollak Corp.
Soreng Products
Square D Co.
Stackpole Carbon Co.
Torsion Balance
Ulanet Co., Geo.
Unimax Switch Corp.
Ward Leonard Elec. Co.
Westinghouse

SWITCHES, Snap Action

Acro-Mu Switch Div.
Arizona Ceramics, Inc.
Automatic Elec. Chicago
Black, Sivalls & Bryson
Carter Parts Co.
Centralab Div.
Clark Controller Co.
Comar Electric Co.
Control Products, Inc.
Cook Electric Co.
Cutler-Hammer
Denison Mfg.
Electro-Snap
Electro Switch
GE Apparatus Sales
Grayhill
Hart Mfg. Co.
Haydon Switch
Hermetic Sealing Corp.
Hetherington, Inc.
Jaidinger Mfg. Co.
Jo-Bell Products
Leeds & Northrup Co.
Micro Switch Div.
Phaostron Co.
Pollak Corp.
Revere Corp.
Square D Co.
Stackpole Carbon Co.
Torsion Balance
Unimax Switch Div.
United Electric
Westinghouse Elec.

SWITCHES, Thermostatic

Acro-Mu Switch Div.
Airite Prod. Co.
Advance Electric Co.
Allen-Bradley Co.
Barber-Colman
Betts & Betts
Bridgeport Thermostat
Bristol Co.
Burling Instrument Co.
Clark Cooper Co.
Comar Electric Co.
Control Products, Inc.
Cook Electric Co.
Cutler-Hammer
Dickson Co.
Edison, Inc., Thomas A.
Fenwal, Inc.
Friez Instruments Div.
General Cement Mfg.
General Controls
GE Apparatus Sales
Gleason-Avery, Inc.
Guardian Electric
G-V Controls
Hart Mfg. Co.
Hawk Tool Eng. Co.
H-B Instruments
Jaidinger Mfg. Co.
Mack Electric Devices
Manning, Maxwell & Moore
Mercoid Corp.
Micro Switch Div.
Minneapolis-Honeywell
Mu-Switch Corp.
Perfex Corp.
Powers Regulator
Precision Thermometer
Shallcross Mfg. Co.
Smith Control & Insts.
Struthers-Dunn
Thwing-Albert Inst.
Ulanet Co., George
Unimax Switch Corp.
United Electric
United Electronic Controls
Viking Instruments
Ward Leonard Electric Co.
Weston Elec. Inst.
Wheelco Div.

SWITCHES, Time

Acro-Mu Switch Div.
Alina Corp.
Allen-Bradley Co.
Anderson, A. & J. M.
Autocall Co.
Automatic Elec. Mfg.
Automatic Temp. Control
Barber-Colman
Betts & Betts
Bristol Motor Div.
Central Scientific
Cincinnati Time Rec.
Clark Controller Co.
Cook Electric Co.
Cramer Co., Inc.
Cutler-Hammer, Inc.
Dietz Co., Henry G.
Dimco-Gray Co.
Durakool Inc.
Eagle Signal Corp.
Edison Instrument Div.
Elastic Stop Nut Corp.
Electric Switch Corp.
Electro-Tech. Equip.
Electyme Motor Prods.
Elgin-Neomatic, Inc.
Ferrara, Inc.
General Cement Mfg.
General Control (Mass.)
General Controls
GE Apparatus Sales
GE Instrument Dept.
Guardian Elec. Mfg. Co.
G-V Controls
Haledy Electronic Co.
Haydon Co., A. W.
Haydon Mfg. Co.
Hetherington, Inc.
Industrial Timer
International Register Co.
Jaidinger Mfg. Co.
Kopp Scientific
Landis & Gyr, Inc.
Leich Elec. Co.
Liebel-Flarsheim Co.
Lumenite Electronic
Lux Clock Mfg. Co.
Mallory & Co.
Masco Products
Mercoid Corp.
Miller-Harris Inst.
Minneapolis-Honeywell
Montgomery Mfg. Co.
Newmatic Corp.
Paragon Electric Co.
Perfex Corp.
Photovolt Corp.
Precision Products, Inc.
Richardson-Allen
Rhodes, Inc., M. H.
Sangamo Electric Co.
Seely Instrument
Soreng Products
Square D Co.
States Co.
Stoelting Co., C. H.
Stromberg Time Corp.
Telechron Dept.
Thomas Clock Co., Seth
Thompson Clock Co.
Tork Clock
Ulanet Co., Geo.
Walker-Jamieson, Inc.
Walser Automatic Timer
Ward Leonard Elec. Co.
Westinghouse Elec.
Wilson & Co.
Yellow Springs Inst.
Zenith Electric

SYNCHRONIZATION FORKS, Electrical (See Forks, Synchronization)

SYNCHRONOUS MOTORS (see Motors, Synchronous)

SYNCHROS (See also Servomotors)

Arga Div., Beckman
Cedar Engineering
Clifton Precision Prod.
Eclipse-Pioneer Div.
Electric Indicator Co.
GE Apparatus Sales
Henschel Corp.
Lectronic Research
Norden-Ketay Corp.
Radex Corp.
Small Motors Inc.
Thordarson-Meissner Mfg.

SYNCHROSCOPES

Control Corp.
Eclipse Aviation
Electric Controller
Feiler Engineering
General Elec. Co.
Haledy Electronic Co.
Hickok Elec. Inst. Co.
Hycon Mfg. Co.
Kollsman Instrument
Millen Mfg. Co.
Roller-Smith Co.
Square D Co.
Tektronix, Inc.
Telechrome, Inc.
T. L. G. Electric
Triplett Elec. Co.
United Optical Mfg.
Westinghouse Elec.
Weston Elect. Inst. Corp.

TACHOGRAPHS

Amthor Testing Inst.
Biddle Co., Jas. G.
Cramer & Co., Inc.
Matisa Equipment
Metron Instrument
Sangamo Electric
Scherr Co., Inc.
Sticht Co.
Zeiss, Inc., Carl
Zernickow Co., O.

TACHOMETER TESTERS (SeeTesters, Tachometer)

TACHOMETERS, Centrifugal

Aeromarine Inst. Co.
Amthor Testing Inst. Co.
Associated Research
Barbour Stockwell Co.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Corbin Screw Corp.
Durant Mfg. Co.
Eclipse-Pioneer Div.
Elec. Tachometer Corp.
Foxboro Co.

TACHOMETERS

TYPE "UO"
UNIVERSAL
CENTRIFUGAL TYPE
With Overspeed Protection
5 Ranges in each Instrument
Cat. No. 303 30-12,000 RPM
Cat. No. 314 45-18,000 RPM
Cat. No. 322 60-24,000 RPM
Cat. No. 346 120-48,000 RPM
Bulletin 751

"JAQUET"
SPEED INDICATORS
(CHRONOMETRIC)
Guaranteed Accuracy within ½ of 1%
Cat. No. 2301 0-10,000 RPM
Cat. No. 2302 0- 1,000 RPM
Cat. No. 2304 0- 100 RPM
Suitable double rated speed. 3 models, various accessories.
Bulletin 735

STATIONARY TYPE
MODEL "J"
Sizes, 3", 4", 5½", 8", 10", and 20" dial diameter, flexible shaft driven.
Many standard ranges reading RPM, FPM, YPM, etc.
Bulletins 795, 796, 797

VIBRATING REED
TACHOMETERS
Portable and Stationary Types. Measure speed by touch. Many different ranges from 900-100,000 RPM.
Bulletin 770

HERMAN H. STICHT CO., INC.
27 PARK PLACE, NEW YORK 7, N. Y.

For more information circle **329** on inquiry card.

Are you having direct reading

ELECTRONIC TACHOMETER

problems because of

- **ODD GEAR RATIOS**
- **TIME BASE SWITCHING**
- **PAD MOUNTED GENERATORS**
- **EXPLOSION-PROOFING**

?

I-L-S Digital Electronic Tachometers and Frequency Counters feature plug-in construction, variable display time, lamp extinguishing, remote readout and simple explosion-proof adaptation. Unique time base design permits single point switching for odd gear ratios and flow measurement. Explosion-proof models meet the latest Air Force Test Stand Specifications. Various styles of impulse generators are available for engine, dynamometer and test stand applications.

ELECTRICAL TACHOMETERS

I-L-S Electric Tachometers are available in 3-inch and 6-inch dial sizes for synchronous 3-phase generator-indicator combinations and standard meter sizes for DC and AC type generators. Automotive Ignition and pulse operated rate meter units with over-speed protection are available for dynamometer or similar applications.

ELECTRONIC TIMERS

GLOW TRANSFER TIMER—I-L-S Glow Transfer Millisecond Timer is a compact, low powered instrument with self-contained precision tuning fork frequency standard. Available in panel mount, portable cabinet or explosion-proof housing.

DIGITAL TIMER—I-L-S Model 4010 Timer is designed primarily for relay timing and similar operations. The instrument features 5 separate start-stop functions and measures intervals from 0.2 milliseconds to 9.99 seconds. Supplied with portable cabinet.

Our Specials

CUSTOM ELECTRONIC TEST EQUIPMENT
VARIABLE DC POWER SUPPLIES
EXPLOSION PROOF INSTRUMENT HOUSINGS
DIGITAL TIMING, COUNTING & CONTROL

ILS

I-L-S INSTRUMENT CORP.
10701 BRIGGS ROAD
CLEVELAND 11, OHIO WI 1-5168
formerly **Instrument Lab. Service**

For more information circle **330** on inquiry card.

General Elec. Co.
Hays Corp.
Instrument Associates
Jones Motorola Corp.
Kahn & Co.
Manning, Maxwell & Moore
Martindale Elec. Co.
Pioneer Instrument Co.
Scherr Co., Inc.
Seedburo Equipment
Square D Co.
Stewart-Warner Corp.
Sticht Co.
Testing Machines, Inc.
Veeder-Root, Inc
Viking Instrument Co
Zernickow Co., O.

TACHOMETERS, Chronometric
Amthor Testing Inst.
Associated Research
Bendix Aviation Corp.
Berkeley Scientific
Biddle Co., Jas. G.
Boulin Inst. Corp.
Cramer & Co., Inc.
Elec. Tachometer Corp.
Elgin Nat'l. Watch Co.
Hasler-Tel Co.
I-L-S Instrument
Jaeger Watch Co.
Matisa Equipment
Pierce Watch Co.
Potter Instrument
Presin Co.
Scherr Co., Inc.
Standard Elec. Time
Sticht Co.
Testing Machine, Inc.
Westport Electric
Wright Engineering
Zernickow Co., O.

TACHOMETERS, Cross-Pendulum
Amthor Testing Inst.
Associated Research
Biddle Co., Jas. G.
Sticht Co.
Zernickow Co., O.

TACHOMETERS, Electric
Air Equipment
Associated Research
Bailey Meter Co.
Beckman & Whitley
Bendix Aviation Corp.
Berkeley Scientific
Bristol Co.
Builders-Providence
Chicago Elec. Tachometer
Clarke Inst. Corp.
Control Engg. Co.
Crown Ind. Prods.
Detectron Co.
Doelcam Div.
Eclipse-Pioneer Div.
Electric Speed Ind. Co.
Elec. Tachometer Corp.
Electrical Develop
Electro Mechano Co.
Electronic Measurements
Engineering Res. & Dev.
Esterline-Angus Co.
Ford Instrument
Foxboro Co.
GE Apparatus Sales
GE Instrument Dept.
General Radio
Hastings Inst. Co.
Hathaway Inst. Co.
Hays Corp.
Hickok Elec. Inst. Co.
Howell Instrument
Ideal Industries, Inc.
I-L-S Instrument
Instrument Associates
Instrument Lab. Inc.
International Res. & Dev.
Jaeger Watch Co.
J-B-T Instruments
Jones Motorola Sales
Kay Electric
Kay-Lab.
Kollsman Instrument
Lear, Inc.
Martin Decker Corp.
Marx, Clarence J.
Metron Instruments
Minneapolis-Honeywell
Minnesota Electronics
Moisture Register Co.
Nat'l. Istrument Co.
Nuclear Research
Photocon Research
Pitometer Log Corp.
Potter Aeronautical
Potter Instrument
Reliance Electric & Eng'ng.
Scherr Co. Inc.
Servo-Tek Products
Square D Co.
Standard Elec. Time
Stewart-Warner
Sticht Co.
Sun Electric Corp.
Sunshine Scientific
Westberg Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Westport Electric
Winslow Co.
Yellow Springs Inst. Co.

TACHOMETERS, Electro-magnetic
American Electronic Mfg.
Berkeley Scientific Co.
D&R, Ltd.
Diehl Mfg.
Doelcam Div.
Eclipse-Pioneer Div.
Electric Auto-Lite
Electric Tachometers
Electro Machano Co.
Engineering Res. & Dev.
Erdco Engineering

BOULIN
INSTRUMENT
CORPORATION

◆

STROBOSCOPIC
TACHOMETER

CHRONOMETRIC
TACHOMETER

CENTRIFUGAL
TACHOMETER

WIRE & YARN
TENSIOMETER

◆

65 Madison Ave.
New York 16, N. Y.

For more information circle **331** on inquiry card.

Fielden Instrument
General Electric Co.
I-L-S Instrument
Ideal Industries
Jaeger Watch Co.
Matisa Equipment
Nat'l. Instrument Co.
Potter Instrument
Presin Co.
Square D Co.
Standard Elec. Time Co.
Stewart-Warner Corp.
Sticht Co.
Sun Electric
Triplett Elec.Inst.
Waltham Watch
Westberg Mfg. Co.
Westinghouse Elec.
Westport Electric.

TACHOMETERS, Fly-ball
Aeromarine Inst. Co.
Associated Research
Barbour Stockwell Co.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Elec. Tachometer Corp.
Jones Motorola Corp.
Kahn & Co.
Stewart-Warner
Sticht Co.
Viking Instrument Co.
Zernickow Co., O.

TACHOMETERS, Ignition Actuated
Electro Mechano Co.
Electro-Tech Equipment
Engineering Res. & Dev.
Erdco Engineering
I-L-S Instrument
Nuclear Research
Potter Instrument
Shephard Laboratories
Stewart-Warner
Sun Electric
Westberg Mfg. Co.

TACHOMETERS, Portable
Amthor Testing Inst. Co.
Associated Research
Barbour Stockwell Co.
Biddle Co., Jas. G.
Boulin Instrument Corp.
Chicago Elec. Tachometer
Corbin Screw Corp.
Elec. Tachometer Corp.
Electrical Develop.
Electro Mechano Co.
Engineering Res. & Dev.
Erdco Engineering
G. E. Apparatus Sales
G. E. Instrument Dept.
Hasler-Tel Co,
Ideal Industries
International Res. & Dev.
Jones Motorola Corp.
Manning, Maxwell & Moore
Martindale Elec. Co.
Matisa Equipment
Metron Instrument Co.
Presin Co.
Rieker Instrument Co.
Scherr Co., Inc.
Stewart-Warner
Sticht Co.
Sun Electric Corp.
Testing Machines, Inc.
United Mfg. Co.
Viking Instrument Co.
Westberg Mfg. Co.
Winslow Co.
Zernickow Co.

TACHOMETERS, Recording
Amthor Testing Inst. Co.
Bailey Meter
Barber Colman
Berkeley Inst. Div.
Biddle Co., Jas. G.
Breeze Corp.
Bristol Co.
Builders-Providence
Electrical Develop
Engineering Res. & Dev.
Erdco Engineering
Esterline-Angus
Fielden Instrument
G. E. Apparatus Sales
G. E. Instrument Dept.
Logan Engg.
Manning, Maxwell & Moore
Matisa Equipment
Metron Instrument Co.
Minneapolis-Honeywell
Potter Aeronautical
Potter Instrument
Scherr Co., Inc.
Sticht Co.
Westberg Mfg. Co.
Wheelco Div.
Zernickow Co.

TACHOMETERS, Speed Limit Control
Askania Regulator Co.
Barbour Stockwell Co.
Bristol Co.
Electro Mechano Co.
Fielden Instrument
Flight Research Eng.
GE Apparatus Sales
Howell Instrument
I-L-S Instrument
Jones Motorola Corp.
Kahn & Co.
Marx, Clarence J.
Matisa Equipment
Metron Inst.
Nuclear Research
Potter Aeronautical
Servo-Tek Products
Sticht Co.

Standard Elec. Time
U. S. Taximeter
Westberg Mfg. Co.
Zernickow Co.

TACHOMETERS, Stroboscopic
Associated Research
Berkshire Laboratories
Boulin Instrument Corp.
Clarke Inst. Corp.
Computer Co. of America
Electronic Meas. Co.
GE Apparatus Sales
General Radio Co.
Ideal Laboratory Tool
I-L-S Instrument
International Res. & Dev.
Opad Electric
Standard Elec. Time
Stewart-Warner
Sticht Co.

TACHOMETERS, Tilting-ring
Aeromarine Instrument
Amthor Testing Inst.
Sticht Co.
Westberg Mfg. Co.
Zernickow Co.

TACHOMETERS, Vibrating Reed
Biddle Co., Jas. G.
J-B-T Instruments
Sticht Co.
Testing Machines, Inc.

TACHOSCOPES
Amthor Testing Inst. Co.
Biddle Co., Jas. G.
I-L-S Instrument
Scherr Co., Inc.
Sticht Co.
Zernickow Co.

TAFFRAIL LOGS, Ship
Aeromarine Instrument
Bliss & Co.
Hand & Sons
Westberg Mfg. Co.

TANGENT METERS (See Meters, Tangent)

TAPE RECORDERS (See Recorders, Magnetic Tape)

TAPE STRETCHER APPARATUS
Testing Machines, Inc.

TAPES, Oil Gagers'
Dietzgen Co.
Keuffel & Esser Co.
Lufkin Rule
Starrett Co.
White Co., David

TAPES, Steel
Bruning Co., Inc.
Dietzgen Co.
Graf-Apsco
Gurley, W. & L. E.
Kueffel & Esser Co.
Lufkin Rule Co.
Speidel & Co.
Starrett Co.
United States Blue Print
Warren-Knight Co.
Weber Co.
White Co., David

TAPES, Surveyors' (See Surveying Instruments)

TAPES, Woven
Dietzgen Co.
Keuffel & Esser
Lufkin Rule Co.
White Co., David

TAXI METERS
U. S. Taximeter

TELEMETERING SYSTEMS (See Remote Metering)

TELEMETERS, Surveying & Military—Optical
Air Associates
Applied Science Corp.
Computer Co. of America
Electro-Mechanical Research
Kollmorgen Optical Co.
Keuffel & Esser Co.
Meyer & Co., Hugo
Pacific Div.
Pierce Watch Co.
Wild Heerbrugg Insts.

TELESCOPES, Alignment
Acme Industrial
Align-A-Scope Inc.
Aremac Associates
Bray Optical Co.
Davidson Mfg. Co.
Edmund Scientific
Engis Equipment
Ercona Corp.
Farrand Optical
Fecker, Inc.
Gaertner Scientific
Griswold Mfg. Co.
Gurley, W. & L. E.
Helio Instrument
Howland Optical Co.
International Dev. Co.
Keuffel & Esser Co.
Kollmorgen Optical Co.
Los Angeles Scien. Inst.
Mann Co., W. I.
Meyer & Co., Hugo
Optical Ser. & Dev.
Penn Optical & Inst.
Perkin-Elmer Corp.
Plummer & Kershaw
Scherr Optical Tools
Stratex Instrument Co.
Tinsley Laboratories
Unertl Optical Co.
White Co., Inc., David
Zeiss, Inc., Carl

TELESCOPES, Astronimical
Bausch Lomb Opt.
Berger & Sons
Bray Optical
Buchele, W.
Bushnell Optical
Clark & Sons
Davidson Mfg. Co.
Eastern Science Co.
Edmund Scientific Corp.
Ercona Corp.
E. & S. Optical
E & W Optical
Fecker, Inc.
Gaertner Scientific Corp.
Gordon Enterprises
Helio Instrument
Henson Co., Fred C.
International Dev. Co.
Laboratory Optical
Mann Co., W. I.
Mico Instrument Co.
Opplem Co., Inc.
Pancro Mirrors
Penn Optical & Inst.
Perkin-Elmer Corp.
Plummer & Kershaw
Tinsley Labs.
Unertl Optical Co.
United Scientific Co.
White Co.
Zeiss, Inc., Carl

TELESCOPES, Azimuth
Align-A-Scope
American Optical
Bushnell Optical
Clark & Sons
Davidson Mfg. Co.
Edmund Scientific Corp.
E. & S. Optical
Fecker, Inc.
Gaertner Scientific Corp.
Gurley, W. & L. E.
Gordon Enterprises
Helio Instrument
International Dev. Co.
Kollmorgen Optical Co.
Mann Co., W. I.
Palos Optical Co.
Penn Optical & Inst.
Perkin-Elmer Corp.
Plummer & Kershaw
Tinsley Labs.
Unertl Optical Co.
Warren-Knight Co.
Warner & Swasey Co.
White Co., David
Zeiss, Inc., Carl

TELESCOPES, Bore & Internal Surface, Inspection
Acme Scientific
American Cystoscope
American Optical
American Instrument
Ames Co., B. C.
Bray Optical
Commercial Optical
Comtor Co.
Eder Instrument Co.
Edmund Scientific Corp.
Engis Equipment
Epic, Inc.
Farrand Optical
Fecker, J. W.
Federal Products Corp.
Gaertner Scienitfic
Gordon Enterprises
Helio Instrument
International Dev. Co.
Jerpbak-Bayless
Kollmorgen Optical Co.
Laboratory Optical
Leitz, Inc.
Lenox Inst. Co.
Magnaflux Corp.
Mann Co., W. I.
Meyer & Co., Hugo
National Electric
Perkin-Elmer Corp.
Plummer & Kershaw
Scherr Optical Tools
Schneider-Cogswell
Swedish Gage Co.
Testa Mfg. Co.
Tinsley Laboratories
Topp Industries, Inc.
Unertl Optical Co.
United Scientific Co.
Welch Allyn, Inc.
White Co., Inc., David
Zeiss, Inc., Carl

TELESCOPES, Laboratory
Align-A-Scope Inc.
Ann Arbor Inst. Wks.
American Optical
Bausch & Lomb
Bray Optical
Bushnell Optical
Central Scientific
Davidson Mfg. Co.
Eberbach & Son
Edmund Scientific Corp.
Fecker, Inc.
Gaertner Scientific Corp.
Gurley, W. & L. E.
Helio Instrument
Henson Co., Fred C.
International Dev. Co.
Laboratory Optical
Mann Co., W. I.
Meyer & Co., Hugo
Opplem Co., Inc.
Optical Ser. & Dev.
Penn Optical & Inst.
Plummer Kershaw
Precise Measurements Corp.
Scherr Co., Inc.
Tinsley Laboratories
Unertl Optical Co.

TELESCOPES, Reflecting
Alfa Photo
Bray Optical
Buchele, W.
Clark Sons
Davidson Mfg.Co .
Edmund Scientific Corp.
Engis Equipment
Ercona Corp.
E. & S. Optical
Fecker, Inc.
Fish-Schurman Co.
Gaertner Scientific
Helio Instrument
Henson Co., Fred C.
Howland Optical Co.
International Dev. Co.
Laboratory Optical
Pancro Mirrors
Mann Co., W. I.
Penn Optical & Inst.
Perkin-Elmer Corp.
Plummer & Kershaw
Tinsley Labs.
Unertl Optical Co.
United Scientific Co.
Warner & Swasey Co.
Zeiss, Inc., Carl
Zoomar Corp.

TELESCOPES, Refracting
Alfa Photo
Align-A-Scope, Inc.
Bausch & Lomb Opt.
Bray Optical
Buchele, W.
Bushnell Optical
Clark & Sons
Davidson Mfg. Co.
Edmund Scientific Corp.
Ercona Corp.
E. & S. Optical Co.
Fecker, Inc.
Fish-Schurman Co.
Gaertner Scientific
Gordon Enterprises
Helio Instrument
Henson Co., Fred C.
Howland Optical Co.
International Dev. Co.
Keuffel & Esser Co.
Laboratory Optical
Mann Co., W. I.
Penn Optical & Inst.
Perkin-Elmer Corp.
Plummer & Kershaw
Tinsley Labs.
Unertl Optical Co.
United Scientific Co.
Warner & Swasey Co.
Wollensak Optical Co.
Zeiss, Inc., Carl
Zoomar Corp.

TELESCOPES, Zenith
Bray Optical
Clark & Sons
Davidson Mfg.Co .
Edmund Scientific
E. & S. Optical
Fecker, Inc.
Gaertner Scientific Corp.
Gordon Enterprises
International Dev. Co.
Mann, Co., W. I.
Penn Optical & Inst.
Perkin-Elmer Corp.
Plummer & Kershaw
Tinsley Labs.
Unertl Optical Co.
White Co., David
Zeiss, Inc., Carl

TELEVISION, Industrial (See Cameras, Television)

TEMPERATURE ALARM SYSTEMS (See Annunciators

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Chatillon & Sons
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Emery Co., A. H.
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General Electric Co.
Georator Corp.
Gilmore Industries
Kushner Labs
Metron Instrument
Millers Falls
Olsen Testing Machine
Pacific Scientific
Refinery Supply Co.
Rutico, Inc.
Saxl Instrument
Schaevitz Engineering
Statham Labs.
Superdraulic Corp.
Suter, Alfred
Telechrome, Inc.
Tensitron, Inc.
Testing Machines, Inc.
Thwing-Albert
Toledo Scale Co.

TENSION INDICATORS
Ann Arbor Inst. Works
Baldwin-Lima-Hamilton
Boulin Instrument
Brush Electronics
Chatillon & Sons
Daystrom Inst.
Daytronic Corp.
Dillon Co., W. C.
Emery Co., A. H.
Federal Products Corp.
General Electric Co.
Georator Corp.
Gilmore Industries
Jo-Line Tools
Olsen Testing Mach.
Pacific Scientific Co.
Precision Scientific
Saxl Instrument
Seederer-Kohlbusch, Inc.
Streeter-Amet Co.
Thwing-Albert Inst.
Tensitron, Inc.
Wiancko Engineering

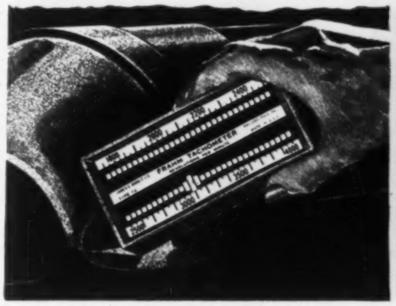
TENSION INDICATORS Textile
Boulin Instrument Corp.
Brush Electronics
Chatillon & Sons
Dillon & Co., W. C.
Federal Products Corp.
General Elec. Co.
Gilmore Industries
Olsen Testing Mach.
Pacific Scientific Co.
Saxl Instrument
Sipp-Eastwood Corp.
Statham Labs.
Tensitron, Inc.
Testing Machines, Inc.
Thwing-Albert Inst.

TEST BLOCKS
Brown & Sharpe
Clarke Instrument
Detroit Testing Mach.
Eastern Specialty Co.
Fish-Schurman Corp.
Fonda Gage Co.
GE Apparatus Sales
Kent Cliff Labs.
Olsen Testing Mach.
Scherr Co., Inc.
States Co.
Steel City Testing Mach.
Testing Machines, Inc.
Torsion Balance Co.
Van Keuren Co.

TEST BLOCKS (Textile)
Boulin Instrument Corp.

TEST INDICATOR
Ames Co., B. C.
Brown & Sharpe
Chicago Dial Indicator
Deming Indicator Co.
Federal Products Corp.
Gadgets Inc.
Gem Instrument Mfg.
Lewis Engineering
Scherr Co., Inc.
Starrett Co.

TEST SET, Diode
Berkshire Labs.
El Mec Labs.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Falstrom Co.
Gadgets Inc.
Gimore Industries
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TEST WEIGHTS (See Weights, Test)

TEST WELLS (See Thermometer Test Wells)

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Amthor Testing Inst. Co.
Atlas Elec. Devices Co.
Baldwin-Lima-Hamilton
Custom Scientific Inst.
Fidelity Mach. Co.
Gardner Laboratory
General Elec. Co.
Larson Instrument
Morehouse Machine Co.
Olsen Testing Machine
Pacific Scientific
Riehle Div.
Scott Testers, Inc.
Shawmut Engr. Co.
Soiltest, Inc.
Suter, Alfred
Taber Instrument Co.
Testing Machines, Inc
Universal Aviation
U. S. Testing Co.
Zuhr, Inc., Henry

TESTERS, Absorption
American Research Corp.
Burrell Corp.
Gurley, W. & L. E.
Hallikainen Inst.
Humboldt Mfg. Co.
Nankervis Co., G. L.
Penn Optical & Inst.
Precision Scientific
Testing Machines, Inc.
Williams Apparatus

TESTERS, Air Speed Indicator (See Air Speed Indicator Testers)

TESTERS, Altimeter (See Altimeter Testers)

TESTERS, Armature
Associated Research, Inc.
Communication Meas. Lab.
General Electric
Instrument Labs.
Martindale Elec. Co.
Schauer Mfg. Co.
Sherron Metallic
Sun Electric

TESTERS, Asphalt
American Inst. Co.
Ann Arbor Inst. Works
Atlas Electric Devices
Bowen & Co.
Braun Corp.
Central Scientific Co.
Chatillon & Sons
Custom Scientific Inst.
Dillon & Co.
Exact Weight Scale
Fish-Schurman Co.
Fisher Scientific Co.
Humboldt Mfg. Co.
Koehler Instrument
Kruger Instruments
Labline, Inc.
La Pine & Co., A. S.
Olsen Testing Mach.
Philadelphia Thermometer
Precision Scientific Co.
Riehle Test. Mach. Div.
Scott Testers, Inc.
Soiltest, Inc.
Technical Equip. Co.
Testing Machines, Inc.
Thwing-Albert Inst.
Weston Elec. Inst.

TESTERS, Axle
Olsen Testing Mach. Co.
Riehle Test. Mach.
Sperry Products, Inc.

TESTERS, Battery
Aerotronic Associates
Arga Div.
Chicago Industrial
Clough-Brengle Co.
Daven Co.
Edelman & Co.
Electro-Mech. Inst.
Electronic Development
Electronic Instrument
Freas Glass Works
General Electric Co.
General Electronic
G. M. Mfg. Co.
Griebel Co.
Hickok Elec. Inst. Co.
Instrument Labs.
Kimble Glass
Larson Instrument
McColpin-Christie
Opad Electric
Owens Illinois Glass
Precision Therm.
Radio City Products
Rascher & Betzold
Rieker Inst. Co.
Simpson Electric
Sterling Mfg.Co .
Sun Electric
Sunshine Scientific
TAB
Testrite Inst. Co.
Triplett Elec. Inst.
Weston Elec. Inst. Corp.

TESTERS, Bearing
Baker Co.
Electro-Mec Lab.
Elgin National Watch
Engineering Res. & Dev.
Erwood, Inc.
General Electric
Illinois Testing Labs.
Micrometrical Mfg. Co.
Panoramic Radio Products
Schwien Mfg. Co.
Vectron, Inc.

TESTERS, Beating
Precision Scientific
Testing Machines, Inc.
Williams Apparatus Co.

TESTERS, Brake
American Inst. Co.
Clough-Brengle Co.
Commercial Research
Cramer & Co., Inc.
Emery Co., Inc.
Epic Inc.
Triumph Mfg. Co.

TESTERS, Cable
Cal-Tronics Corp.
Dillon & Co., W. C.
Dit-Mco, Inc.
Frungel, Inc.
Mine Safety Appliances
Precise Measurements
Technical Development

TESTERS, Camera Shutter
American Chronoscope
Berkeley Inst. Div.
G. M. Mfg. Co.
Gordon Enterprises
Hycon Mfg. Co.
I-L-S Instrument
Shepard Laboratories
Sunshine Scientific
Triumph Mfg. Co.

TESTERS, Chlorine
Everson Mfg. Co.
Hellige, Inc.
Industrial Inst. Inst.
LaMotte Chemical Prods.
Photovolt Corp.
Precision Scientific
Rascher & Betzold
Taylor & Co., W. A.
Wallace & Tiernan

TESTERS, Coal (See Fuel below)

TESTERS, Coil (Electric)
Associated Research
Biddle Co., James
Boonton Radio Corp.
California Magnetic
Clippard Inst. Lab.
Clough-Brengle Co.
Columbia Technical Corp.
Daystrom Inst.
Diatron Co.
Electronic Instrument
Feiler Engineering
GE Apparatus Sales
General Electronic
General Radio
Ideal Industries
Industrial Insts., Inc.
Industrial Test Equip.
Instrument Labs.
Kahn & Co.
Kay Electric
Kellogg Switchboard
Martindale Elec. Co.
Pacific Instrument
Panoramic Radio Co.
Radex Corp.
Rubicon Co.
Schauer Mfg. Co.
Sherron Metallic
Sun Electric
Sunshine Scientific
Technology Instrument
Thordarson Elec. Mfg.
United Optical Mfg.
United Transformer

TESTERS, Color
Atlas Electric Devices Co.
Ercona Corp.
Fisher Scientific Co.
Gaertner Scientific Co.
Gardner Laboratory
General Elec.Co .
Hallikainen Inst.
Hellige, Inc.
Huggins Labs.
Instrument Dev. Labs.
Jackson Electrical Inst.
Kaye Development
Kay Electric
Koehler Instruments
Librascope
Macbeth Corp.
Penn Optical & Inst.
Photovolt Corp.
Precise Measurements Co.
Shasta Div.
Testing Machines, Inc.
Weston Elec. Inst.

TESTERS, Condenser
ACF Electronics
Aerovox Corp.
Associated Research
Barnes Development Co.
Boonton Radio Corp.
Bradshaw Instruments
Brown Electro-Measurement
Brush Electronics Co.
Clippard Inst. Lab.
Clough-Brengle Co.
Cornell-Dubilier
Daystrom Inst.
Deltron, Inc.
Doelcam Div.
Electronic Development
Electronic Instrument
Federal Telephone
Feiler Engineering
Fox Valley Inst.
General Electric Co.
General Electronic
General Radio Co.
Hickok Elec. Instrument
Industrial Insts. Inc.
Industrial Test Equip.
Instrument Labs.
Jackson Electrical Inst.
Kahn & Co.
Kay-Lab.
Kellogg Switchboard
Opad Electric
Phaostron Co.
Potter Co.
Radio City Products
Reiner Electronics
Rubicon Co.
Schauer Mfg. Co.
Shallcross Mfg. Co.
Sherron Metallic
Sun Electric
Sylvania Elec. Prod.
Tobe Deutschmann Corp.
Triplett Electhical Inst.
Westberg Mfg. Co.
Weston Elec. Inst. Corp.
Williams Apparatus

TESTERS, Deflection, Light Wave
Acme Industrial
Bowser, Inc.
Engis Equipment
Gaertner Scientific Corp.
Industrial Test Equip.
Opplem Co., Inc.
Sherron Metallic
Van Keuren Co.

TESTERS, Dew Point
American Inst. Co.
American Research Corp.
Anders Lykens Corp.
Atmosphere Control
Bowser, Inc.
Burton Mfg. Co.
Central Scientific
Ferner Co.
GE Apparatus Sales
G. M. Mfg. Co.
Illinois Testing Labs.
Instrument Dev. Labs.
Kruger Instruments
Phoenix Prec. Inst.
Refinery Supply Co.
Weston Elec. Inst.

TESTERS, Dielectric, Properties
American Transformer Co.
Antenna Research Lab.
Associated Research, Inc.
Aviation Engr. Corp.
Boonton Radio Corp.
Central Research Labs.
Del Electronics
Doelcam Div.
Electronic Dev. Lab.
Federal Telephone
Fielden Instrument
GE Apparatus Sales
General Instrument
General Radio
Hallikainen Inst.
Industrial Test Equip.
Instrument Labs
Jarco Services
Kahn & Co.
Leeds & Northrup Co.
Marconi Inst.
Miller Co., B. F.
Peschel Electronics
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Refrigeration Systems
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Roller-Smith
Sargent & Co., E. H.
Sherron Metallic
U. S. Testing Co.
Westinghouse Elec.
Weston Elec. Inst.
Winslow Co.
Yellow Springs Inst.

TESTERS, Electroplating (See Electroplating Solution Testing Apparatus)

TESTERS, Emulsion & Demulsibility
Central Scientific Co.
Precision Scientific
Technical Equip. Co.

TESTERS, Expansion
Dietert Co.
Dillon & Co., W. C.
Exact Weight Scale Co.
Ferner Co.
Humboldt Mfg. Co.
Gaertner Scientific Corp.
Refrigeration Systems
Testing Machines, Inc.
Thwing-Albert Inst. Co.

TESTERS, Fading
American Research Corp.
Atlas Elec. Devices Co.
Gardner Lab.
Gen. Elec. Vapor Lamp

TESTERS, Flash Point, Abel's
Humboldt Mfg. Co.
Labline, Inc.
U. S. Testing Co.

TESTERS, Flash Point, Abel-Pensky's (See Abel's above)

TESTERS, Flash Point, Cleveland Open Cup
American Inst. Co.
Boekel & Co.
Central Scientific Co.
Eitzen Co., L. C.
Humboldt Mfg. Co.
Koehler Instrument
Labline, Inc.
LaPine & Co.
Olsen Testing Machine
Precision Scientific Co.
Ruehfel Co.
Soiltest, Inc.
Weston Elec. Inst.

TESTERS, Flash Point, Elliott Closed Cup
American Inst. Co.
Central Scientific Co.
Humboldt Mfg. Co.
Precision Scientific Co.
Ruehfel Co.
Weston Elec. Inst.

TESTERS, Flash Point, Pensky-Martens
American Inst. Co.
Boekel & Co.
Central Scientific Co.
Humboldt Mfg. Co.
Koehler Instrument
Labline, Inc.
LaPine & Co., A. S.
Precision Scientific Co.
Ruehfel Co.
Weston Elec. Inst.

TESTERS, Flash Point, Tag Closed
Boekel & Co.
Central Scientific Co.
Eitzen Co.,L. C.
Humboldt Mfg. Co.
Koehler Instrument
Labline, Inc.
Precision Scientific Co.
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Opplem Co., Inc.
Optron Laboratory
Phoenix Prec. Inst.
Scherr Co., Inc.
Sherron Metallic
Van Keuren Co.,
Zeiss, Inc., Carl
Zenith Optical Lab.

TESTERS, Fluorescent Lighting

Eitzen Company
Ideal Industries
Littlefuse, Inc.
Skaneateles Mfg.
Sylvania Elec. Prod.

TESTERS, Freeness

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Dietert Co.
Testing Machines, Inc.
Williams Apparatus Co.

TESTERS, Fuel

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Central Scientific Co.
Cuthbert Co.
Emerson Apparatus Co.
Fish-Schurman Co.
Fisher Scientific Co.
G. M. Mfg. Co.
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Nuclear Research
Parr Instrument Co.
Phillips Petroleum
Precision Scientific
Riehle Div.
Sargent & Co., E. H.
Sturtevant Mill
Technical Equip. Co.
Testing Machines, Inc.

TESTERS, Gage (See Gage Testers)

TESTERS, Gas (See Gas Analyzers)

TESTERS, Gear

Airborne Instruments
Dillon & Co., W. C.
Engineering Res. & Dev.
Ercona Corp.
Fellows Gear Shaper
Ferner Co.
Jerbak-Bayless, Co.
Krouse Testing Mach.
Morse Twist Drill
National Broach & Machine
Olsen Testing Mach.
Scherr Co., Inc.

TESTERS, Glue

Central Scientific Co.
Dillon & Co., W. C.
Fish-Schurman Co.
Koehler Instruments
National Forge
Olsen Testing Machine
Physicists Research
Thwing-Albert Inst. Co.

TESTERS, Grain

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Burrows Equip.
Central Scientific Co.
Cuthbert Co.
Exact Weight Scale
Grain Lab. Equip.
Menlo Research Lab.
Moist-O-Meter, Inc.
Moisture Register Co.
Newark Scale Works
Precision Scientific Co.
Seedburo Equipment
Toledo Scale Co.
Troemner, Henry
Weston Elec. Lab.

TESTERS, Grease (See Grease Testing Apparatus)

TESTERS, Grinding Wheel

Hygrotester, Inc.
Kinetic Instrument
Nuclear Research
Olsen Testing Machine
Stewart Instrument
Taber Instrument

TESTERS, Ground Resistance

Associated Research
Automatic Electric Chicago
Biddle Co., Jas. G.
Borden Engineering
Dit-Mco, Inc.
Doelcam Div.
General Electric Co.
General Electronic
Georator Corp.
Gray Instrument
Heiland Div.
Industrial Insts., Inc.
Instrument Labs.
Kahn & Co.
Leeds & Northrup
Miller, M. C.
Niagara Electric
Roller-Smith
Sensitive Res. Inst.
Shallcross Mfg.
Sherron Metallic
Sticht & Co.
Thwing-Albert
United Optical Mfg.
Winslow Co.

TESTERS, Hardness of Grindable Materials

Ames Precision Machine
Ann Arbor Inst. Wks.
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Ferner Co.
Gardner Laboratory
Gogan Machine Corp.
Gordon Co., Claud S.
Gordon Enterprises
Opplem Co., Inc.
Riehle Testing Machines
Taber Instrument
Testing Machines, Inc.
Torsion Balance Co.
Wilson Mechanical Inst.

TESTERS, Hardness of Plastic Films

Ann Arbor Inst. Works
Bush Associates, G. F.
Custom Scientific Insts.
Ferner Co.
Gardner Lab.
Gordon Co., Claud S.
Moore Company, H. R.
Munsell Color Co.
Precision Scientific
Steel City Testing
Taber Instrument Co.
Testing Machines, Inc.
Torsion Balance Co.
Universal Aviation
Wilson Mechanical Inst.

TESTERS, Hydrogen Ion (See Hydrogen-Ion Determination Instruments)

TESTERS, High Altitude (See Chambers Instrument Test)

TESTERS, Insulation

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Aircraft Electronics
American Transformer
Antenna Research Lab.
Associated Research
Automatic Elec. Chicago
Beta Electric Corp.
Biddle Co., Jos. G.
Bill Jack Scientific
Boonton Radio Corp.
California Magnetic
Cal-Tronics Corp.
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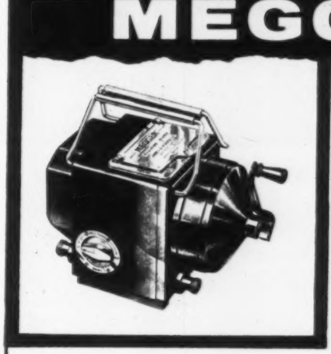

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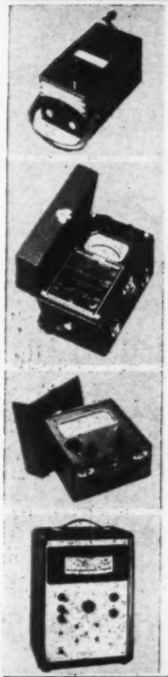

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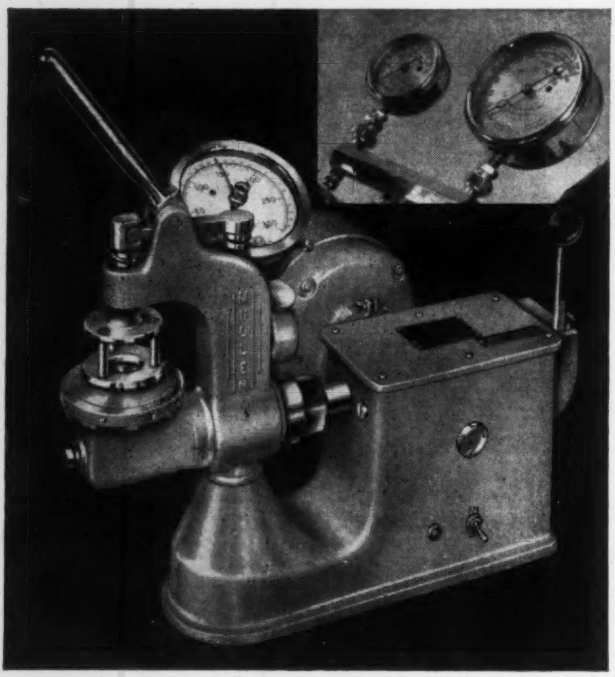

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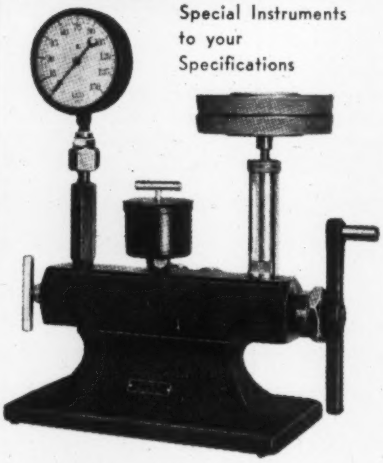

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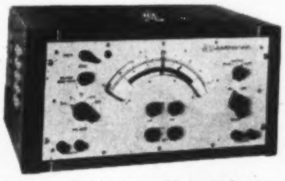

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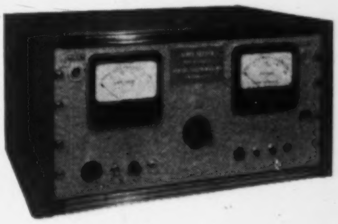

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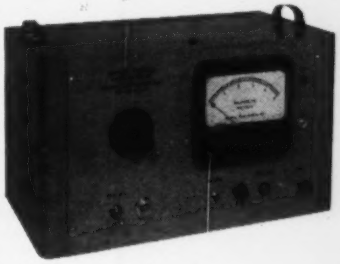

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Chicago Ind. Inst.
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Feiler Engineering
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Instrument Labs.
Islip Radio Mfg.
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MacLeod & Hanopol
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Peschel Electronics
Phaostron Co.
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Pyramid Inst. Co.
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Rubicon Co.
Shallcross Mfg. Co.
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Schauer Mfg. Corp.
Sensitive Research Inst.
Simpson Electric Co.
Sittler Corp.
Standard Products Inc.
Sticht Co.
Sylvania Elec. Prod.
Trenton Transformer
Triplett Elec. Inst.

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American Time Prods.
G. M. Mfg. Co.
Gordon Enterprises
Paulson & Co.
Potter Instrument

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Barnstead Still
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Fischer & Porter
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Williams Apparatus

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Eastern Specialty Co.
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Electron-Radar Prod.
GE Apparatus Sales
GE Instrument Dept.
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Kahn & Co.
Multi-Amp. Corp.
Rockwell Engr.
Sangamo Electric Co.
States Co.
Westinghouse Elec.

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Anetsberger Bros.
Atlas Elec. Devices Co.
Electric Hotpack Co.
Gen. Elec. Lamp Dept.
National Carbon Co.
Precision Scientific
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American Instrument
American Meas. Insts.
American Optical
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Bausch & Lomb Optical
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Engis Equipment
Ercona Corp.
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Olsen Testing Machine
Riehle Div.
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Arlin Products
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Krouse Testing Mach.
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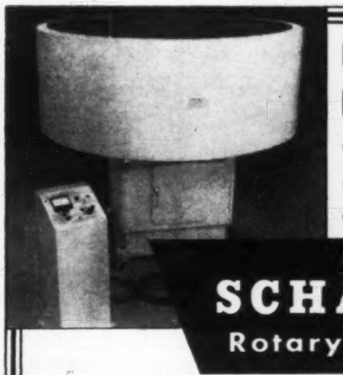

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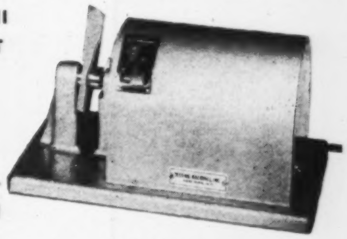

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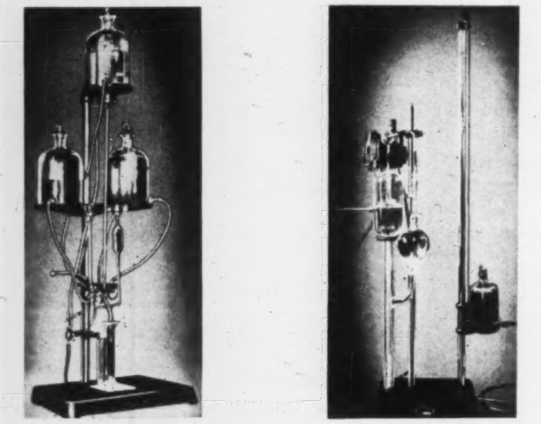

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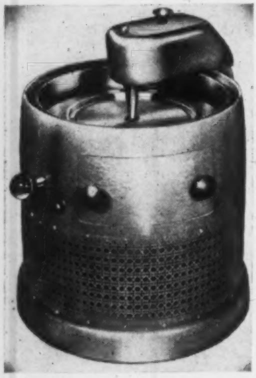

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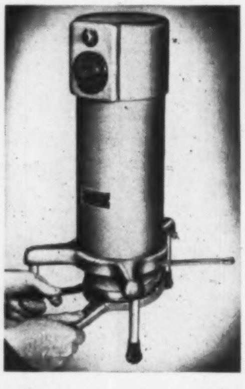

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Pressure Products
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Pacific Transducers
Riehle Testing Machines
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Amsler Buehler
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Branson Instruments
Detroit Testing Mach.
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Pacific Transducers
Pittsburgh Inst. & Mach.
Riehle Testing Machines
Scott Testers
Steel City Testing Mach.
Taber Instrument Co.
Testing Machines, Inc.

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Chatillon & Sons
Detroit Testing Mach.
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Link Engineering
Olsen Testing Machine
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Scott Testers
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Mico Instrument
Norcross Corp.
Olsen Testing Mach.
Pelouze Mfg. Co.
Perkins & Son
Riehle Testing Machine
Saxl Instrument
Scott Testers
Shawmut Eng. Co.
Shore Instruments
Special Instruments Lab
Standard Elec.
Suter, Alfred
Taber Instrument Co.
Tensitron, Inc.
Testing Machines, Inc.
Thwing-Albert Inst. Co.
U. S. Testing Co.

TESTING MACHINES, Thread

Amthor Testing Inst. Co.
Anderson Machine Shops
Boulin Instrument Corp.
Bush Associates, G. W.
Chatillon & Son
Custom Scientific Inst.
Dillon & Co., W. C.
Fielden Instrument
Hacker & Co.
Instron Engr. Corp.
Jerpbak-Bayless Co.
Norcross Corp.
Olsen Testing Mach.
Schaevitz Engg.
Saxl Instrument
Scott Testers, Inc.
Standard Elec.
Suter, Alfred
Testing Machines, Inc.
Thwing-Albert Inst. Co.
U. S. Testing Co.
Zeiss, Inc., Carl

TESTING MACHINES, Torsion

Airdraulics Engineering
Ann Arbor Inst. Wks.
Baldwin-Lima-Hamilton
Boulin Instrument Corp.
Chatillon & Sons
Consolidated Engg.
Detroit Testing Mach.
Emery Co., A. H.
Exact Weight Scale
General Electric Co.
Hacker & Co.
Hathaway Inst. Co.
Hayes Scientific App.
Impact Register Co.
Industrial Engineering
Kahn & Co.
Krouse Testing Mach.
Link Engineering
Martin-Hubbard Corp.
M. B. Mfg. Co.
Metron Instrument
Olsen Testing Mach.
Pelouze Mfg. Co.
Riehle Testing Machines
Scott Testers, Inc.
Steel City Testing
Sturtevant Co.
Testing Machines, Inc.
Toledo Scale Co.
Vectron, Inc.

TESTING MACHINES, Torsional Creep

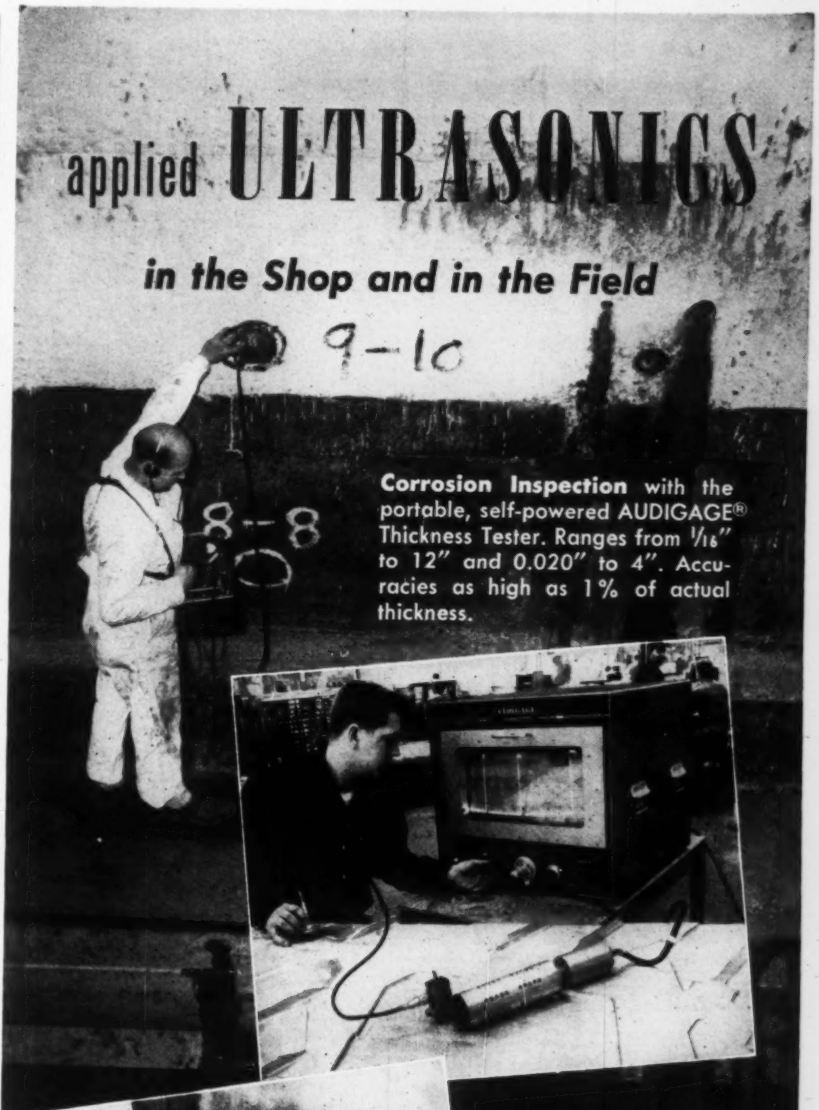
Ann Arbor Inst. Works
Baldwin-Lima-Hamilton
Hacker & Co.
Olsen Testing Machine
Pacific Scientific
Riehle Testing Machines

TESTING MACHINES, UNIVERSAL, Dead weight beam, Capacities 0-100 lb.

Ann Arbor Inst. Wks.
Dietert Co.
Dillon & Co., W. C.
Ferner Co.
Gordon Co., Claud S.
Hacker & Co.
Olsen Testing Machine
Refinery Supply
Riehle Testing Machines
Testing Machines, Inc.
Thwing-Albert Inst.

TESTING MACHINES, UNIVERSAL, Dead Weight Beam, Capacities 100-5000 lb.

Amsler Buehler
Ann Arbor Inst. Wks.
Baldwin-Lima-Hamilton
Dillon & Co., W. C.
Gordon Co., Claud S.
Hacker & Co.
Olsen Testing Machine
Refinery Supply
Riehle Testing Machines
Scott Testers, Inc.
Testing Machines, Inc.



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development
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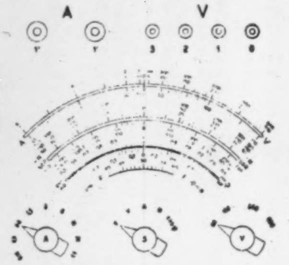

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of single-phase or three phase A.C.

MODEL
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Power Factor: 0-1 capacitive and inductive.
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Frequency: 40-50-60 cy. (Single phase or three - phase).
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Baldwin-Lima-Hamilton
Dillon & Co., W. C.
Gordon Co., Claud S.
Hacker & Co.
Olsen Testing Mach.
Riehle Testing Machines
Testing Machines, Inc.
Thwing-Albert Inst.

TESTING MACHINES, UNIVERSAL, Dead weight beam, Capacities over 100,000 lb.
Baldwin-Lima-Hamilton
Gordon Co., Claud S.
Hacker & Co.
Olsen Testing Machine
Riehle Testing Machines

TESTING MACHINES, Universal, Hydraulic, Capacities 0-100 lb.
Ann Arbor Inst. Works
Con Ray Corp.
Dietert Co., Harry W.
Electro Products Labs.
Emery Co., A. H.
Gordon Co., Claud S.
Hacker & Co.
Olsen Testing Mach.
Pacific Scientific
Riehle Testing Machines
Steel City Testing Mach.
Superdraulic Corp.
Testing Machines, Inc.
Thwing-Albert Instrument

TESTING MACHINES, Universal, Hydraulic, Capacities 100-5000 lb.
Ann Arbor Inst. Wks.
Baldwin-Lima-Hamilton
Con Ray Corp.
Detroit Testing Machine
Dietert Co., Harry W.
Electro Products Labs.
Emery Co.
Ferner Co.
Gordon Co., Claud S.
Hacker & Co.
Olsen Testing Mach.
Pacific Scientific
Riehle Testing Machines
Steel City Testing Mach.
Superdraulic Corp.
Testing Machines, Inc.
Thwing-Albert Inst.
Vectron, Inc.

TESTING MACHINES, Universal, Hydraulic, Capacities 5000-100,000 lb.
Ann Arbor Inst. Wks.
Baldwin-Lima-Hamilton
Con Ray Corp.
Detroit Testing Mach.
Emery Co., A. H.
Ferner Co.
Gordon Co., Claud S.
Hacker & Co.
Olsen Testing Mach.
Pittsburgh Instrument
Riehle Testing Machines
Soiltest, Inc.
Steel City Testing Mach.
Superdraulic Corp.
Testing Machines, Inc.
Thwing-Albert Inst.
Wabash Metal Products
Wroble Engineering Co.

TESTING MACHINES, Universal, Hydraulic, Capacities over 100,000 lb.
Baldwin-Lima-Hamilton
Emery Co., A. H.
Ferner Co.
Gordon Co., Claud S.
Hacker & Co., W. J.
Olsen Testing Mach.
Riehle Testing Machines
Soiltest, Inc.
Superdraulic Corp.

TESTING MACHINES, Universal Pendulum, Capacities 0-100 lb.
Amthor Testing Inst. Co.
Control Engg. Co.
Dietert Co.
Dillon & Co., W. C.
Gordon Co., Claud S.
Hacker & Co.
Olsen Testing Mach.
Riehle Testing Machines
Scott Testers, Inc.
Steel City Testing
Sun Electric
Suter, Alfred
Testing Machines, Inc.
Thwing-Albert Inst. Co.

TESTING MACHINES, UNIVERSAL. Pendulum. Capacities 100-5000 lb.
Amthor Testing Inst. Co.
Amsler Buehler
Control Engg. Co.
Dietert Co.
Gordon Co., Claud S.
Hacker & Co.
National Forge
Olsen Testing Machine
Riehle Testing Machines
Scott Testers, Inc.
Steel City Testing
Sun Electric
Testing Machines, Inc.
Thwing-Albert Inst.

TESTING MACHINES, UNIVERSAL Pendulum. Capacities 5000-100,000 lb.
Amthor Testing Inst. Co.
Gordon Co., Claud S.
Hacker & Co., W. J.
National Forge
Olsen Testing Machine
Riehle Testing Machines
Steel City Testing
Thwing-Albert Inst.

TESTING MACHINES, UNIVERSAL. Pendulum. Capacities over 100,000 lb.
Amthor Testing Inst. Co.
Hacker & Co.
Olsen Testing Machine
Riehle Testing Machines
Steel City Testing

TESTING MACHINES, UNIVERSAL, Spring Dynamometers, Capacities 0-100 lb.
Ann Arbor Inst. Wks.
Baldwin-Lima-Hamilton
Chatillon & Sons
Dillon & Co., W. C.
Ferner Co.
Gordon Co., Claud S.
Hacker & Co.
Industrial Engineering
Olsen Testing Mach.
Pacific Scientific
Riehle Testing Machines
Scott Testers, Inc.
Stoelting Co., C. H.
Testing Machines, Inc.
Thwing-Albert Inst. Co.
Toledo Scale Co.

TESTING MACHINES, UNIVERSAL, Spring Dynamometers, Capacities 100-5000 lb.
Ann Arbor Inst. Wks.
Baldwin-Lima-Hamilton
Chatillon & Sons
Dillon & Co., W. C.
Dietert Co.
Dorr-Patterson Eng.
Ferner Co.
Gordon Co., Claud S.
Hacker & Co.
Hayes Scientific App.
Industrial Engineering
Olsen Testing Mach.
Pacific Scientific
Riehle Testing Machines
Scott Testers, Inc.
Stoelting Co., C. H.
Testing Machines, Inc.
Toledo Scale Co.

TESTING MACHINES, UNIVERSAL, Spring Dynamometers, Capacities 5000-100,000 lb.
Ann Arbor Inst. Wks.
Baldwin-Lima-Hamilton
Chatillon & Sons
Dillon & Co., W. C.
Ferner Co.
Gordon Co., Claud S.
Hacker & Co.
Industrial Engineering
Olsen Testing Mach.
Riehle Testing Machines
Scott Testers, Inc.
Testing Machines, Inc.
Toledo Scale Co.

TESTING MACHINES, UNIVERSAL, Spring Dynamometer, Capacities over 100,000 lb.
Baldwin-Lima-Hamilton
Chatillon & Sons
Ferner Co.
Gordon Co., Claud S.
Hacker & Co.
Industrial Engineering
Olsen Testing Mach.
Toledo Scale Co.

TESTING MACHINES, Vibration
All Amer. Tool & Mfg.
Amthor Testing Inst. Co.
Associated Research
Baldwin-Lima-Hamilton
Biddle Co.
Brush Electronics
Calidyne Co.
Century Geophysical
Commercial Research
Electro-Mec Lab.
Electro-Products Lab.
Engineering Res. & Dev.
Ferner Co.
Fielden Instrument
GE Apparatus Sales
GE Instrument Dept.
General Radio
Geotechnical Corp.
Hacker & Co.
Hathaway Instrument
Heiland Research
International Res. & Dev.
Krouse Testing Machine
L.A.B. Corp.
Martin-Hubbard Corp.
M. B. Mfg. Co.
RCA Div.
Rollin Co.
Sticht Co.
Technical Instruments
Techno Inst. Co.
Testing Machines, Inc.
Walkirt Co.
Westinghouse Elec.

TESTING MACHINES, Wire
Amthor Testing Inst. Co.
Amsler Buehler
Ann Arbor Inst. Wks.
Baldwin-Lima-Hamilton
Bush Associates, G. F.
Custom Scientific Inst.
Dillon & Co., W. C.
General Elec. Co.
Gilmore Industries
Hacker & Co.
Hunter Spring
Instron Eng. Corp.
Krouse Testing Mach.
Manson Labs
Norcross Corp.
Olsen Testing Machine
Peschel Electronics
Riehle Testing Machines
Rubicon Co.
Scott Testers, Inc.
Standard Elec.
Steel City Testing
Taber Instrument Co.
Testing Machines, Inc.
Thwing-Albert Inst. Co.

TESTING MACHINES, Yarn
Amthor Testing Inst. Co.
Anderson Machine Shops
Atlas Elec. Devices Co.
Baldwin-Lima-Hamilton
Chatillon & Son
Custom Scientific Inst.
Dillon & Co., W. C.
Emerson Apparatus Co.
Fielden Instrument
Hart Moisture Gage
Hygrotester, Inc.
Instron Eng. Corp.
Minneapolis-Honeywell
Olsen Testing Mach.
Saxl Instrument
Schaevitz Engineering
Scott Testers, Inc.
Sheffield Corp.
Standard Elec.
Suter, Alfred
Testing Machines, Inc.
Thwing-Albert Inst. Co.
U. S. Testing Co.

TESTING SETS (See also object of measurement and control)

TESTING SETS, Alcohol
Fischer & Porter
G. M. Mfg. Co., Inc.
Griebel Co.
Kahl Scientific Inst.
Microchemical Specialties
Precision Therm.
Rascher & Betzold
Ruehfel Co.
Scientific Glass App.
Weksler Thermometer
Weston Elec. Inst.

TESTING SETS, Automotive
Beam Instrument
Clough-Brengle Co.
Englehard, Chas.
Fox Valley Inst.
General Electronic
Gow-Mac Instrument
Hays Corp.
Industrial Engineering
Nuclear Research
Potter Co.
Quality Electric
Schauer Mfg. Co.
Sun Electric
Westberg Mfg. Co.

TESTING SETS, Cable
Associated Research
Authorized Mfrs. Service
Automatic Elec. Chicago
Biddle Co., James G.
Century Geophysical
Columbus Products Corp.
Communication Meas. Lab.
Con Ray Corp.
Desco Mfg. Co.
Dit-Mco, Inc.
Eastern Specialty
Electronic Control Systems
Feiler Engineering
General Elec. Co.
General Radio Co.
Gray Instrument
Industrial Test Equip.
Instrument Labs.
International Std. Trading
Kahn & Co.
Leeds & Northrup
Littelfuse, Inc.
Manson Labs
Panellit, Inc.
Peschel Electronics
Precise Measurements
Rubicon Co.
Shallcross Mfg.
Sherron Meteallic
United Optical Mfg.
Westinghouse Elec.
Winslow Co.

TESTING SETS, Communication Circuits
Airborne Instruments
American Electroneering
Authorized Mfrs. Service
Automatic Elec. Chicago
Bell & Howell
Bunnell & Co., J. H.
Clough-Brengle
Collins Radio Co.
Computer Co. of America
Con Ray Corp.
Daven Co.
Desco Mfg. Co.
Electro Products Labs.
Electronic Dev. Lab.
Feiler Engineering
Freed Transformer
General Electronic
Geotechnical
Hewlett-Packard
Hycon Mfg. Co.
Instrument Laboratories
International Std. Trading
Jersey City Tech. Lab.
Kahn & Co.
Kay Electronic
Kellogg Switchboard
Leeds & Northrup
Littelfuse, Inc.
Marconi Instruments
Meters, Inc.
Norden Instruments
Pacific Instrument
Phaostron Co.
Precision Apparatus
Radiaphone Co.
Radio City Products
Reiner Electronics
Rubicon Co.
Shallcross Mfg.
Sherron Metallic
Simpson Electric
Sylvania Elec. Prod.
Technology Inst. Corp.
Virginia Electronics
Waveform, Inc.
Weston Elec. Inst. Corp.
Winslow Co.

TESTING SETS, Current Transformer
Assembly Products
Cal-Tronics Corp.
Eastern Specialty
Elec. Facilities Inc.
Federal Telegraph Co.
Feiler Engineering
G.E.Apparatus Sales
Industrial Test Equip.
Kahn & Co.
Leeds & Northrup
Physics Research
Rubicon Co.
Sherron Metallic
States Co.
Thordarson-Meissner

TESTING SETS, Electrical
Aero Electronics
Airborne Instruments
Air-O-Tronics
American Transformer
Associated Research
Automatic Elec. Chicago
Biddle Co., James G.
Borden Engineering
Bradshaw Instruments
Cal-Tronics Corp.
Chicago Ind. Inst.
Clarke Inst. Corp.
Clough-Brengle Co.
Columbia Elec. Mfg.
Columbia Technical Corp.
Communication Meas. Lab.
Con Ray Corp.
Dale Instruments
Desco Mfg. Co.
Dice Co., J. W.
Dit-Mco, Inc.
Eastern Specialty
Elec. Facilities, Inc.
Electro Devices, Inc.
Electronic Control Systems
Electronic Dev. Lab.
Electronic Instrument
El Mec Laboratories
Esterline-Angus
Federal Telephone
Feiler Engineering
Gadgets, Inc.
G E Apparatus Sales
General Electronic
Gray Instrument
Hermetic Sealing Corp.
Hewlett-Packard
I-L-S Instrument
Industrial Engineering
Industrial Inst., Inc.
Instrument Laboratories
Kahn & Co.
Kay Electric
Link Engineering
Meter Devices Co.
Millivac Instruments
Multi-Amp
Norden Instruments
Peschel Electronics
Phaostron Co.
Physics Research
Potter Instrument
Precision Apparatus
Pyramid Instrument
Radiaphone Co.
Rawson Elec. Inst. Co.
RCA Div.
Roller-Smith Co.
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
Simpson Electric
Sittler Corp.
Sticht Co.
Sun Electric
Superior Electric Co.
Thordarson-Meissner
Tobe Deutschmann Corp.
Triplett Elec. Inst.
Union Switch
United Optical Mfg.
Virginia Electronics
Westinghouse Elec.
Weston Elec. Inst. Corp.
Winslow Co.

TESTING SETS, Electrical Thermometer
Chicago Ind. Inst.
Daystrom Inst.
Desco Mfg. Co.
Feiler Engineering
Gadget Inc.
Gray Instrument
Leeds & Northrup
Lewis Engineering
Minneapolis-Honeywell
Minnesota Electronics
Rubicon Co.
Shallcross Mfg. Co.
Sherron Metallic
Thwing-Albert Instrument
Weston Elec. Inst.
Winslow Co.

TESTING SETS, Ground RESISTANCE (See Tester, Ground Resistance)

TESTING SETS, Insulation, (See Testers, Insulation)

TESTING SETS, Line Current
Associated Research
Automatic Elec. Chicago
Bourns Labs.
Cal-Tronics Corp.
Columbia Elec. Mfg.
Elec. Facilities, Inc.
Electronic Development
Esterline Angus
Feiler Engineering
General Elec. Co.
General Electronic
Gray Instrument
Hickok Elec. Inst.
Instrument Laboratories
Kahn & Co.
Meter Devices Co.
Precision Apparatus
Roller-Smith
Rubicon Co.
Sensitive Research Inst.
Sherron Metallic
Simpson Electric Co.
Sticht Co.
Triplett Elec. Inst.
Weston Elec. Inst. Corp.

TESTING SETS, Meters, Electrical
Assembly Products
Associated Research
Automatic Elec. Chicago
Beckman Instruments
Biddle Co., James G.
Booth Co., Arthur H.
Bourns Labs.
Chicago Indust. Inst.
Clippard Inst. Lab.
Clough-Brengle Co.
Computer Co. of America
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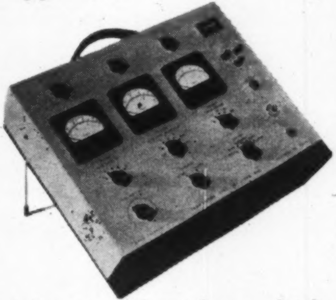
Type 210



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h_{12}, voltage feedback ratio.
h_{22}, output admittance.
h_{21}, current gain, emitter input, $(\propto)$.
β , current gain, base input.
I_{co}, collector saturation current.

And with external oscillator and voltmeter:
Alpha cut-off frequency.
Beta cut-off frequency.
Collector capacitance.

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Electronic Dev. Lab.
Esterline Angus
Feiler Engineering
General Elec. Co.
General Electronic
Gray Instrument
Hathaway Instrument
Hewlett-Packard
Industrial Test Equip.
Kahn & Co.
Marion Elec. Inst.
Miller, M. C.
Phaostron Co.
Physics Reesarch
Precise Measurements Co.
Radio City Products
Rawson Elec. Inst. Co.
RCA Div.
Reiner Electronics
Roller-Smith
Rubicon Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
Simpson Electric Co.
Standard Elec. Time
States Co.
Sticht Co.
Stratex Instrument Co.
Sun Electric
Thwing-Albert Inst. Co.
Triplett Elec. Inst.
Virginia Electronics
Westinghouse Elec.
Weston Elec. Inst. Co.

TESTING SETS, Meters, Fluid
American Meter Co.
Bailey Meter Co.
Brooks Rotameter
Fischer & Porter
Kahn & Co.
Phaostron Co.
Weston Elec. Inst.

TESTING SETS, Portable Combustion
Bacharach Ind. Inst. Co.
Dwyer Mfg. Co.
Ellison Draft Gage
Engelhard, Chas.
Hays Corp.
Schauer Mfg. Co.

TESTING SETS, Potential Transformer
Eastern Specialty Co.
Elec. Facilities, Inc.
GE Apparatus Sales
Industrial Test Equip.
Leeds & Northrup Co.
Manson Labs.
Physics Research
Precise Measurements
Raytheon Mfg. Co.
Sherron Metallic
Thordarson-Meissner

TESTING SETS, Telephone
Automatic Elec. Chicago
Berkeley Scientific
Bradshaw Instruments
Daven Co.
Electronic Development
Federal Telegraph Co.
General Electric
General Electronic
Instrument Laboratories
Kellogg Switchboard
Rubicon Co.
Sherron Metallic
Supreme, Inc.
Shallcross Mfg. Co.
Technology Instrument

TESTING SETS, Transistor
Aero Electronics
El Mec Labs.
General Electronic
Hydro-Aire, Inc.
Kay Electric Co.
Naybor Labs, E. V.
Owen Labs.
Polyphase Instrument
Scientific Specialties

TESTING SETS, Water
Barnstead Still
Bogue Elec. Mfg.
Burrell Corp.
Hagan Corp.
Hellige, Inc.
Industrial Inst., Inc.
LaMotte Chemical Prod.
Phipps & Bird
Scientific Glass App.
Taylor & Co., W. A.
Wallace & Tiernan

TESTING SIEVE SHAKER (See Sieve Shakers)

TESTING SIEVES (See Sieves, Testing)

THEODOLITES (See Surveying Instruments)

THEODOLITES, Magnetic
Berger & Sons
Gulton Mfg. Co.
Gurley, W. & L. E.
Helio Instrument
International Dev. Co.
Opplem Co., Inc.
Ruska Inst. Corp.
Suverkrop Instrument
White Co. Inc., David
Wild Heerbrugg

THEODOLITE, Pilot Balloon
Davidson Mfg. Co.
Fecker Inc., J. W.
Gordon Enterprises
Gulton Mfg. Co.
Gurley, W. & L. E.
Helio Instrument
Los Angeles Scientific Inst.
White Co., Inc., David

THERMIONIC RECTIFIERS (See Rectifiers, Thermionic)

THERMISTORS
Carboloy Dept., G E
Computer Co. of America
Electron-Radar Prods.
Hewlett-Packard
International Std. Trading
Kybernetes Corp.
Narda Corp.
Olympic Development
Servo Corp.
Stupakoff Ceramic
Victory Engineering

THERMO-AMMETERS (See Ammeters, Thermo)

THERMOCOUPLE Circuit Tester
Peerless Electric

THERMOCOUPLE EXTENSION LEAD WIRE
Assembly Products
Barber Colman
Bristol Co.
Electro-Tech Equipment
Engelhard, Inc., Chas.
Foxboro Co.
GE Apparatus Sales
GE Instrument Dept.
Gordon Co., Claud S.
Hoskins Mfg. Co.
Illinois Testing Labs.
Indus. Pyrometer & Supply
Leeds & Northrup
Lewis Engineering
Minneapolis-Honeywell
Pyrometer Instrument Co.
Revere Corp.
Richards Co., A. S.
Thermo-Electric Co.
Thwing-Albert
Uniform Tubes Inc.
West Instrument
Weston Elec. Inst.
Wheelco Div.

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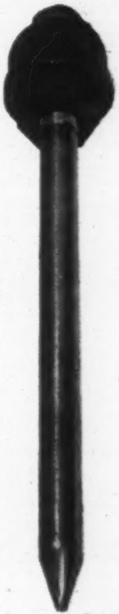

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- Lead Wire
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- Protecting Tubes
- Heads and Connectors

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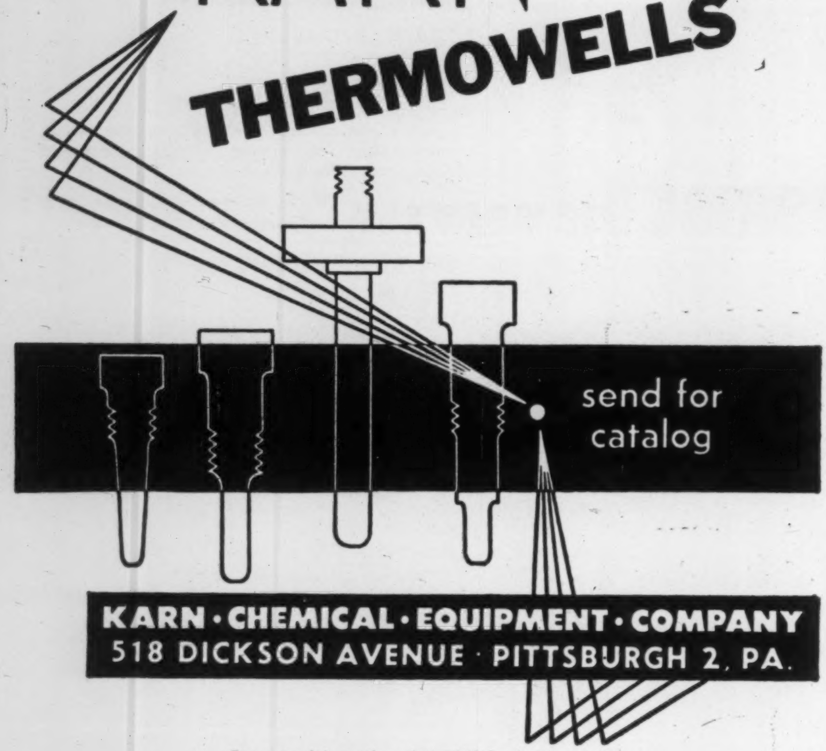

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Moeller Inst. Co.
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Pacific Transducers
Palmer Thermometers
Precision Thermometer
Refinery Supply
Scientific Glass App.
Scientific Instrument
Taylor Inst. Cos.
Thermo-Electric
Thermometer Corp.
Thwing-Albert Inst. Co.
Trerice Co.
Trinity Equipment
Turner Electric Co.
U. S. Gauge Co.
Victory Eng'ng.
Weksler Thermometer
Weston Elec. Inst.

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Am. Temperature Ind.
Arnoux Corp.
Associated Research
Assembly Products
Avionic Products
Bailey Meter Co.
Barber-Colman
Bogue Elec. Mfg.
Bristol Co.
Burlington Instrument
Cleveland Fuel Equip.
De Jur-Amsco Corp.
Edison Inc., Thomas A.
Electric Auto-Lite
Engelhard, Chas.
Fielden Instrument
Foxboro Co.
Friez Instrument Div.
Giannini & Co.
General Controls
GE Apparatus Sales
GE Instrument Div.
Gordon Co., Claud S.
Gow-Mac Instrument
G-M Labs.
G. M. Mfg. Co.
Gray Instrument
Hays Corp.
Hickok Elec. Inst.
Ill. Testing Labs
Instrument Associates
J-B-T Insts, Inc.
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Pacific Scientific
Penn Ind. Inst. Corp.
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Thermometer Corp.
Thwing-Albert Instrument
Trans-Sonics, Inc.
Trerice Co.
Triplett Elec. Inst.
United Optical Mfg.
Victory Eng'ng.
Webber Gage Co.
Weiler, Paul G.
West Corp.
West Instrument
Weston Elec. Inst. Corp.
Wheelco Div.
Winslow Co.

THERMOMETERS, Indicating, Mechanical

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Bacharach Ind. Inst.
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Bar-Ray Products
Bristol Co.
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Electric Auto-Lite Co.
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Pacific Transducers
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Karn Chemical Equip.
Leeds & Northrup Co.
Lewis Engg.
McDanel Refractory
Minneapolis-Honeywell
Moeller Instrument Co.
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Pyrometer Service Co.
Revere Corp.
Richards, Arklay S.
Taylor Instrument Cos.
Thermal Syndicate Ltd.
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Thwing-Albert Inst. Co.
Trinity Equipment
Turner Electric Co.
Viking Electric
West Corp.
West Instrument
Weston Elec. Inst.
Wheatstone Corp.

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American Platinum Wks.
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Barber-Colman
Bishop & Co., J.
Breeze Corporations
Bristol Co.
Electro-Tech Equipment
Engelhard, Inc., Chas.
GE Apparatus Sales
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Gordon Co., Claud S.
Hoskins Mfg. Co.
Illinois Testing Labs.
Indus. Pyrometer & Supply
Leeds & Northrup
Lewis Engineering
Minneapolis-Honeywell
Pyrometer Instrument Co.
Reeder & Co., Chas.
Revere Corp.
Richards Co., A. S.
Thermo Electric Co.
Thwing-Albert Inst.
West Instrument
Weston Elec. Inst.
Wheelco Div.

THERMOCOUPLES, Base Metal

Airflo Instrument Co.
Assembly Products
Bacharach Industrial Inst.
Bailey Meter Co.
Barber-Colman
Bishop & Co., J.
Bristol Co.
Burlington Inst. Co.
Campbell Co., J. A.
Conax Corp.
Cybertronic Corp.
DeJur-Amsco
Dyna-Labs
Elematic Equip. Corp.
Engelhard, Chas.
Foxboro Co.
General Controls
G E Apparatus Sales
G E Instrument Dept.
Gordon Co., Claud S.
Gordon Machine & Tool
Hastings Inst. Co.
Huppert Co.
Ill. Testing Labs.
Indus. Pyrometer & Supply
Industrol Corp.
Instrument Lab.
J-B-T Insts. Inc.
Leeds & Northrup
Lewis Engg. Co.
Loudon Div., Land-Air
Marshall Co., L. H.
Meters, Inc.
Minneapolis-Honeywell
Pacific Scientific
Perkin-Elmer
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Pyrometer Service Co.
Revere Corp.
Richards Co., Inc., Arklay
Standard Tool & Machine
Taylor Inst. Cos.
Thermo Electric Co.
Thwing-Albert Instrument
Trinity Equipment
Uniform Tubes Inc.
United Optical Mfg.
Viking Electric
West Corp.
West Instrument
Westinghouse Elec.
Weston Elec. Inst.
Wheelco Inst. Co.
Winslow Co.

THERMOCOUPLES, Contact Type

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Amer. Thermo-Elec.
Bailey Meter Co.
Barber-Colman
Breeze Corporations
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Cambridge Inst. Co.
Campbell Co., J. A.
Cannon Electric
De Jur-Amsco
Elematic Equip. Corp.
Engelhard, Charles
Field Elec. Inst.
Freas Glass Works
General Controls Co.
GE Apparatus Sales
GE Instrument Dept.
Gordon Co., Claud S.
Hickok Elec. Inst. Co.
Ill. Testing Labs.
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J-B-T Instruments
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Minneapolis-Honeywell
Phen-Trols, Inc.
Precision Tube Co.
Pyrometer Instrument
Pyrometer Service Co.
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Richards Co., Inc.
Rowe Engineering
Rutico, Inc.
Sensitive Research Inst.
Simpson Electric Co.
ThermoElectric Co.
Thwing-Albert Instrument
Ultradyne Engrg.
Uniform Tubes, Inc.
Viking Electric
West Corp.
West Instrument
Weston Elec. Inst.
Wheelco Div.
Winslow Co.

THERMOCOUPLES, Rare-metal (See Base Metal above)

THERMOCOUPLES, Separate Heater Type

Aero Research
Amer. Thermo-Elec.
Barber Colman
Beam Instrument
Breeze Corporations
Bristol Co.
Campbell Co., J. A.
Electron-Radar Prod.
Electro-Tech Equip. Co.
Field Elec. Inst.
General Controls
General Elec. Co.
General Radio Co.
Gordon, Claud S.
Illinois Testing Labs.
Lewis Engrg.
Sensitive Research Inst.
Ultradyne Engrg.
Vacuum Tube Prods.
West Corp.
West Instrument
Wheelco Div.

THERMOCOUPLES, Vacuum

Amer. Thermo-Elec.
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Beam Instrument
Beckman Instruments
Biddle Co., James G.
Cambridge Inst. Co.
Consolidated Vacuum Corp.
Distillation Products
Farrand Optical
Fredericks Co., George
Field Electric Inst.
GE Apparatus Sales
General Radio Co.
Gordon Co., Claud S.
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Hickok Elec. Inst. Co.
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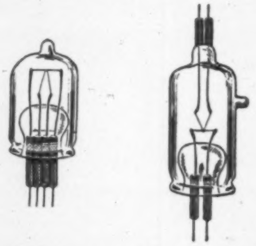

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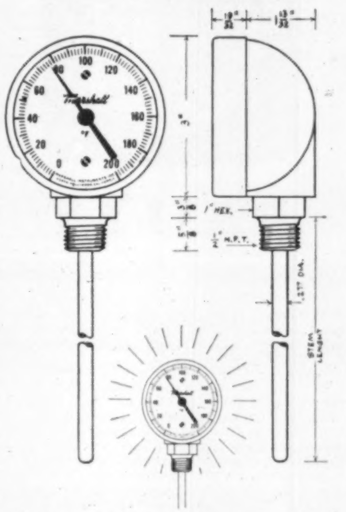

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Weiss & Son
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Electric Auto-Lite Co.
Ever Ready Thermometer
Fleischhauer & Son
Foxboro Co.
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Gotham Instr. Div.
Green, Henry J.
H-B Instrument
Hiergesell & Sons
Kahl Scientific Inst.
Kessler Co., Walter
Larson Instrument
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Scientific Instrument Co.
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Thermometer Corp.
Trerice Co., H. O.
Wagner & Son
Weksler Thermometer
Weston Elec. Inst. Corp.

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Palmer Thermometers
Penn Ind. Inst. Corp.
Powers Regulator Co.
Precision Thermometer
Pyrometer Instrument
Reliable Instrument
Rochester Mfg. Co.
Ryan Recording
Scientific Inst. Co.
Taylor Inst. Cos.
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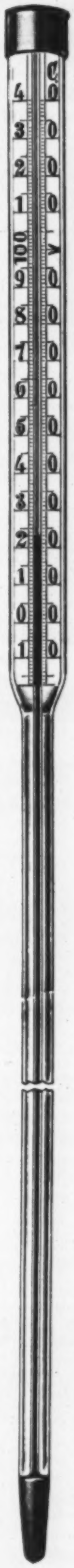

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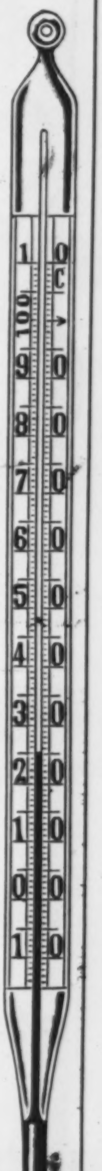

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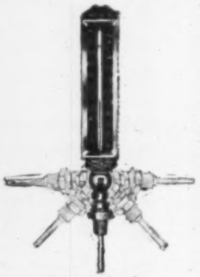

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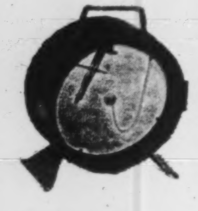

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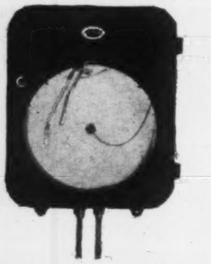

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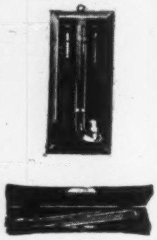

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Thermometer Corp.
Thwing-Albert Instrument
Trerice Co.
Victory Eng'ng.
Wagner & Son
Weksler Thermometer
West Instrument
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Friez Instrument
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Partlow Corp.
Penn Ind. Inst. Div.
Philadelphia Scientific
Powers Regulator
Republic Flow Meters
Ryan Rec. Thermometer
Scientific Instrument
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Standard Thermometer
Taylor Inst. Cos.
Thermometer Corp.
Thwing-Albert Inst.
Trerice Co.
Weksler Thermometer
Weston Elec. Inst.

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Green, Henry J.
Hagan Corp.
H-B Instrument
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Kahl Scientific Inst.
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Mason-Neilan Regulator
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Trerice Co.
U. S. Gauge Co.
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Trerice Co.
Wagner & Son
Weksler Thermometer
Weston Elec. Inst.

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Weston Elec. Inst.

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- Platinum resistance temperature element measures −300F to 1200F; transmits to pre-calibrated "plug-in" type receivers in Bailey a-c PYROTRON.

One to four continuous temperature records are made on a single 12 in. circular chart. Each recording pen responds instantly since it is controlled by a separate inertia-free electronic detector. Each detector has its own power supply A small, reversible electric motor balances the a-c Wheatstone bridge circuit, and drives the indicating, recording and controlling features. The Bailey a-c PYROTRON may be furnished with pneumatic or electric control.

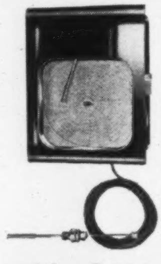
Any combination of electrically or pneumatically transmitted factors may be combined with temperature in the same recorder which features continuous, one-year, automatic inking.

For detailed information write for Product Specification E12-5.

BAILEY METER COMPANY
1041 IVANHOE ROAD · CLEVELAND, O.
Bailey Meter Company Ltd., Montreal, Canada

For more information circle **360** on inquiry card.

THERMOMETERS, —Recording and Automatic Controlling . . . for temperatures from −125F to +1000F



Bristol Series 500 Thermometers, the product of over 60 years of instrument-making experience, feature the latest developments in instrument engineering.

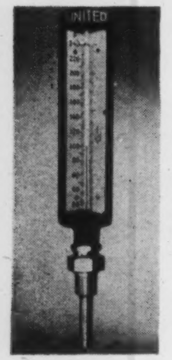
In manufacturing hundreds of thousands of recording and automatic controlling thermometers, The Bristol Company has developed a variety of models, sizes, and temperature ranges to fill every requirement.

Write for Bulletin T840.

BRISTOL COMPANY
112 Bristol Rd., Waterbury 20, Conn.

For more information circle **358** on inquiry card.

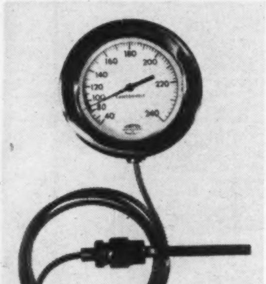
INDUSTRIAL THERMOMETERS



DIAL THERMOMETERS
PRESSURE GAGES

The United Instrument Company has been for many years a manufacturer of "Special requirement instruments." Its products have always been made to precise specifications with respect to range, internal and external construction and fittings as well as finishes, in effect custom made instruments.

UNITED INSTRUMENT CO.
574 President St., Brooklyn 15, N. Y.



For more information circle **359** on inquiry card.

THERMOPILES
Baird Associates
Beckman & Whitley
Biddle Co., James G.
Bristol Co.
Cambridge Inst. Co.
Co-Design Corp.
Conax Corp.
Engelhard, Chas.
Eppley Lab.
Field Elec. Inst.
Gaertner Scientific Corp.
General Controls
Gordon Co., Claud S.
Hastings Instruments
Illinois Testing Labs.
Jarrel-Ash Co.
Leeds & Northrup Co.
Perkin Elmer
Pyrometer Instrument
Rawson Electric Inst.
Reeder & Co., Charles M.
Revere Corp.
Thermo-Elec. Co.
United Control
Williamson Dev.

THERMOREGULATORS, Bimetallic
American Instrument
Bar-Ray Products Inc.
Bristol Co.
Central Scientific
Electric Hotpack
Gordon Co., Claud S.
Kauffman-Lattimer
Leeds & Northrup
Moeller Inst. Co.
National Appliance
Perfex Corp.
Reliable Instrument
Stevens Mfg. Co.
Taylor Inst. Cos.
Thermometer Corp.
Ulanet Co., Geo.
Valverde Labs.

THERMOREGULATORS, Mercury-In-Glass
Accuracy Scientific Inst.
Aloe Co., A. S.
American Instrument
Central Scientific
Chicago Surgical & Elec.
Electric Hotpack Co.
Fish-Schurman Corp.
Fisher Scientific Co.
Friez Instrument Div.
G. M. Mfg. Co.
Green, Henry J.
H-B Instrument
Hiergesell & Sons, Wm.
Kessler Co., Walter
Labline, Inc.
LaPine & Co., A. S.
Moeller Instrument
Philadelphia Scientific
Philadelphia Thermometer
Precision Scientific Co.
Precision Thermometer
Process & Instruments
Refinery Supply Co.
Reliable Instrument
Sargent & Co., E. H.
Scientific Glass App.
Scientific Inst. Co.
Taylor Instrument Cos.
Thermometer Corp.
Weksler Thermometer
Weston Elec. Inst.

THERMOSTATIC METALS (See Metals, Thermostatic)

THERMOSTATS
Accuracy Scientific Inst.
Acro Switch Div.
Allen-Bradley Co.
Alloy Bellows Engr.
American Inst. Co.
A-P Controls Corp.
Barber-Colman
Brabender Corp.
Bridgeport Thermostat
Bristol Co.
Burling Inst.Co.
Chicago Surgical & Elec.
Control Products, Inc.
Cook Electric
Curtis Dev. & Mfg.
Curtiss-Wright
Denison Engg.
Dickson Co.
Douglass Automatic
Edison Inc., Thomas
Electric Controls
Electric Hotpack Co.
Elematic Sales Corp.
Electro-Tech Equip. Co.
Emerson Apparatus Co.
Farris Stacon
Fenwal, Inc.
Fish-Schurman Co.
Fulton Sylphon Div.
GE Apparatus Sales
General Controls
Gleason-Avery
G-V Controls
Hagan Corp.
Hart Mfg. Co.
Hawk Tool Eng. Co.
H-B Instrument
Keckley Co., O. C.
Klipfel Mfg. Co.
Labline, Inc.
Mack Electric Devices
Manning, Maxwell & Moore
Mechanical Industries
Mercoid Corp.
Minneapolis-Honeywell
Partlow Corp.
Penn Electric Switch
Philadelphia Scientific
Philadelphia Thermometer
Powers Regulator Co.
Precision Scientific Co.
Precision Therm. & Inst.
Preferred Utilities
Premier Crystal Labs.
Rascher & Betzold
Reliable Instrument
Sarco Co., Inc.
Scientific Glass App.
Security Valve Corp.
Smith Control & Inst.
Soreng Products
Standard Therm., Inc.
Stevens Mfg. Co.
Tenney Engineering
Trerice Co.
Ulanet Co.
United Elec. Controls
Valverde Labs.
Viking Instruments, Inc.
Westinghouse Elec.
Weston Elec. Inst.
Wilcolator Co.
Zeiss, Inc., Carl

THERMO-VOLTMETERS (See Voltmeters, Thermo)

THERMOWELLS (See Thermometer Test Wells)

THICKNESS GAGES (See Gages, Thickness)

THREAD MEASURING WIRES (See Wires, Thread Measuring)

TIDE GAGES
American Inst. Co.
Bristol Co.
Foxboro Co.
Gurley, W. & L. E.
Leupold & Stevens
Penn Ind. Inst. Div.
Uehling Inst. Co.

TIME, Controllers (See Controllers, Automatic, Time)

TIME DELAY RELAYS (See Relays, Time Delay)

TIME, Indicators
Abrams Instrument
Advance Electronics
Aero Instrument
Alina Corp.
Amer. Chronoscope
Atomic Instrument
Automatic Elec. Chicago
Automatic Temp. Control
Berkeley Scientific
Bristol Co.
Bristol Motor Co.
Brush Electronics Co.
Century Geophysical
Cincinnati Time Rec.
Cook Electric
Cramer Co., R. W.
Crystal Research Labs.
Cyclotron Specialties
Dimco-Gray Co.
Doelcam Div.
Eclipse-Pioneer Div.
Electric Tachometer
Elgin National Watch
Engler Inst.
Foxboro Co.
Gaertner Scientific Corp.
GE Apparatus Sales
GE Instrument Dept.
General Controls
Gotham Inst. Div.
Hamilton Watch
Haydon Co., A. W.
Haydon Mfg. Co.
Industrial Timer
International Bus. Mach.
Jaeger Watch Co.
J-B-T Instruments
Lafayette Instruments
Marsh Corp.
Matisa, Equipment
National Time & Signal
Potter Instrument
Precision Scientific Co.
Rawson Electrical Inst.
Seely Inst. Co.
Serdex, Inc.
Standard Elec. Time
Stoelting Co., C. H.
Stromberg Time Corp.
Sunshine Scientific
Telechron Inc.
Thompson Clock Co.
Walkirt Co.
Westinghouse Elec.
Weston Elec. Inst.
Westport Electric
Yellow Springs Inst.

TIME, Recorders
Abrams Instrument
Aero Instrument
Alina Corp.
American Time Prod.
Automatic Elec. Chicago
Automatic Temp. Control
Barbour-Stockwell
Berkeley-Scientific Corp.
Bristol Co.
Brush Electronics
Calculagraph Co.
Century Geophysical
Cincinnati Time Rec.
Clary Multiplier
Clebar Watch Co.
Cramer & Co., Inc.
Cyclotron Specialties
Ducommun Co.
Electric Tachometer
Electro-Tech Equip. Co.
Engler Inst.
Esterline-Angus Co.
Foxboro Co.
Friez Instrument Div.
Gaertner Scientific Corp.
GE Apparatus Sales
General Controls
Gordon Enterprises
Gorrell & Gorrell
Gotham Inst. Div.
Hamilton Watch
Haydon Co., A. W.
Haydon Mfg. Co.
Hathaway Instrument
International Bus. Mach.
Jaeger Watch Co.
Lafayette Instrument
Larson Instrument
Lumenite Electronic
Martin-Hubbard Corp.
Matisa Equipment
Potter Instrument
Scientific Inst. Co.
Service Recorder Co.
Simplex Time Recorder
Stoelting Co., C. H.
Streeter-Amet Co.
Stromberg Time Corp.
Weston Elec. Inst.

TIME INTERVAL APPARATUS
Abrams Instrument
Advance Electronics
Aero Instrument
Amer. Chronoscope
Am. Gas Accumulator
Amglo Corp.
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Temp. Control
Barber-Colman
Berkeley Scientific
Betts & Betts
Bill Jack Scientific
Bristol Co.
Browning Laboratories
Brush Electronics
Builders-Providence
Burke & James
Cal-Tronics Corp.
Cincinnati Time Rec.
Clark Controller Co.
Clary Multiplier
Coleman Elec. Co.
Cramer Co., Inc.
Crystal Research Labs.
Daystrom Inst.
Detectron Co.
Dimco-Gray Co.
Dorothea Mechanisms, Gale
Electric Tachometer
Electrical & Physical
Electro-Physics Co.
Electronic Control
Engler Inst.
Esterline-Angus
Fredericks Co., Geo.
Gaertner Scientific
GE Apparatus Sales
General Controls
General Electric X-Ray

HERMETICALLY SEALED
THERMOSTATS

These miniature thermostats illustrated actual size are ideal for control electronic applications.

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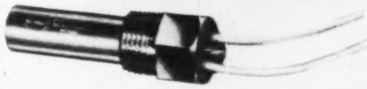

Series FM Thermostats offer the only unit that can withstand mechanical clamping or pinching without effect on set calibration.

● The Ulanet catalog, illustrating and describing the worlds' largest line of precision thermostats is available without obligation. Write on your letterhead.

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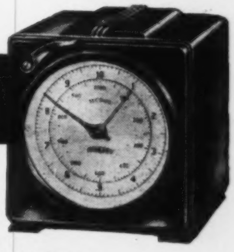
For more information circle 361 on inquiry card.

Standard
TIMERS



WORLD'S MOST ACCURATE AND RUGGED TIME MEASURING INSTRUMENT. CAN BE MANUALLY OR ELECTRICALLY OPERATED. FURNISHED IN PORTABLE CASES OR FOR PANEL MOUNTING.

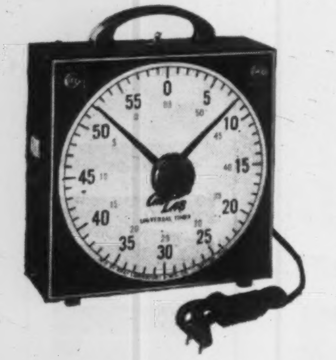
Model	Reads	Totalizes	Accuracy
S-100	1/5 sec.	6000 sec.	±.1 sec.
S-60	1/5 sec.	60 min.	±.1 sec.
SM-60	1/100 min.	60 min.	±.002 min.
S-10	1/10 sec.	1000 sec.	±.02 sec.
S-6	1/1000 min.	10 min.	±.0002 min.
S-1	1/100 sec.	60 sec.	±.01 sec.
MST	1/1000 sec.	.360 sec.	±.001 sec.
MST-500	1/1000 sec.	30 sec.	±.002 sec.

WRITE FOR BULLETIN 198
also Standard Chrono-Tachometers •
Standard Custom-built Laboratory Test and Distribution panels

THE Standard Electric Time Co.
65 Logan Street STANDARD FOUNDED 1884 Springfield, Mass.

For more information circle 362 on inquiry card.

Ferrara, Inc.
Miller-Harris Inst.



GRA LAB

THE ALL PURPOSE LABORATORY TIMER

- 3600 Settings
- Split-Second Accuracy
- Automatic Switching
- Giant 8" Dial
- Portable Models
- Panel Mount Models

Every Gra-Lab Universal Timer can be set for any desired time period within an unusually wide range of 3600 possible settings, (Ie.—1 sec. to 60 min., 1 min. to 60 hrs., etc.). At end of preset interval buzzer alarm sounds and external load is automatically switched on or off. Priced at $21.95 to $26.95.

ELECTRIC STOP CLOCKS—GRA-LAB Micro Timers with large 8" dials are available in 1/10 second or 1/1000 minute graduations for accurate measurements of elapsed time, in laboratory or production operations. Priced at $37.50.

Contact your laboratory supply house today!
. . . or write direct for complete catalog to

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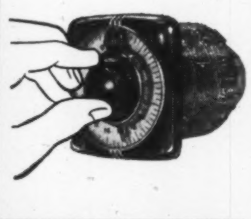

low cost
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. . . installation
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miniature
. . . for space economy

maximum circuit flexibility
. . . more than 145 electrical arrangements

An entirely new concept in automatic time interval control, Atcotrol is designed to be the standard in its field.

Requires but one clearance hole for mounting. Atcotrol timer can be demounted from panel in 2 seconds without tools. Completely serviced with a screwdriver. Either reset or stop on power failure. Motor, clutch and reset operation visible from front. Instantaneous reset. No pointer rebound. Built to NEMA standards. Conservatively rated at 10 amps. *Repeat accuracy within .1 of 1%.* Many other new and exclusive features.

Write for complete information.
Trial unit available to o.e.m.'s.
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5200 Pulaski Ave., Philadelphia 44, Pa.

Represented in Canada by: Powerlite Devices, Ltd., Toronto, Montreal and Vancouver.

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ATCOTROL
RESET TIMERS

For more information circle **365** on inquiry card.

General Mills, Inc.
Gordon Enterprises
Gorrell & Gorrell
Guardian Elec. Mfg. Co.
Haledy Electronics
Hathaway Instrument
Haydon Co., A. W.
Haydon Mfg. Co.
Hycon Mfg. Co.
I-L-S Instrument
Industrial Timer Corp.
Lafayette Instrument
Leeds & Northrup
Lumenite Electronic
Martin-Hubbard Corp.
Masco Products
Miller Corp., Wm.
Montgomery Mfg. Co.
National Time & Signal
Nelson & Street
Norden-Ketay Corp.
Paragon Electric Co.
Perfex Corp.
Phipps & Bird
Photoswitch, Inc.
Potter Instrument
Pratt & Whitney
Rawson Elec. Inst. Co.
RCA Div.
Rea Co., J. B.
Revere Corp.
Rhodes Inc., M. H.
Rutherford Electronics
Serdex, Inc.
Sinclair-Collins Valve
Soreng Products
Standard Elec. Time Co.
Stoelting Co., C. H.
Streeter-Amet Co.
Stromberg Electric Co.
Sunshine Scientific
Thompson Clock Co.
Thordarson-Meissner
Walkirt Co.
Wallace & Tiernan
Walser Automatic Timer
Westinghoue Elec. & Mfg.
Westport Electric
Wiancko Eng'ng.
Wilson & Co.
Yellow Springs Inst. Co.
Zenith Electric

TIME METERS (See Meters, Time)

TIME OPERATION RECORDERS

Aero Instrument
Authorized Mfrs. Service
Automatic Elec. Chicago
Automatic Temp. Control
Bacharach Ind. Inst.
Bristol Co.
Burlington Instrument
Calculagraph Co.
Cincinnati Time Rec.
Cramer & Co., Inc.
Dickson Co.
Ducommun Co.
Elec. Tachometer Corp.
Elematic Sales Corp.
Engler Inst.
Esterline-Angus Co.
Foxboro Co.
Gaertner Scientific Co.
GE Apparatus Sales
Gorrell & Gorrell
Gotham Inst. Div.
Hamilton Watch
I-L-S Instrument
Instrument Lab., Inc.
Intern'l Business Mach.
Jaeger Watch Co.
Larson Instrument
Minneapolis-Honeywell
National Time & Signal
Production Inst. Co.
Service Recorder Co.
Stoelting Co., C. H.
Stromberg Time Corp.
Weksler Thermometer
Weston Elec. Inst.

TIME STAMPS

Acromark Co.
Cincinnati Time Recorder
International Bus. Mach.
Simplex Time Recorder
Stromberg Time Corp.

TIME STUDY APPARATUS

Alden Products
Alfax Paper & Eng.
Amer. Chronoscope
Automatic Temperature
Bell & Howell
Berndt-Bach, Inc.
Black & Webster
Clare & Co., C. P.
Clebar Watch Co.
Cramer Co., Inc.
Dietzgen Co., Eugene
Dimco-Gray Co.
Ducommun Co.
Electric Tachometer Corp.
Engler Inst.
Gordon Enterprises
Gorrell & Gorrell
Lafayette Instrument
Larson Instrument
National Instrument
Potter Instrument Co.
Seely Instrument Co.
Standard Electric Time
Stewart Instrument
Stoelting Co., C. H.
Technical Instruments
Thompson Clock
Wollensak Optical

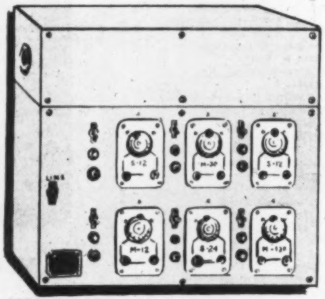
TIME SWITCHES (See Switches, Time)

TIMERS, AUTOMATIC, Automatic Reset

Alina Corp.
Allen-Bradley Co.
American Chronoscope
Amglo Corp.
Atomic Instrument
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Temp. Control
Barber-Colman
Berkeley Scientific Div.
Betts & Betts
Bill Jack Scientific
Bristol Co.
Bristol Motor Div.
Cincinnati Time Recorder
Clark Controller Co.
Clark Cooper Co.
Control Engg. Co.
Cook Electric Corp.
Counter & Control Corp.
Cramer Co., Inc.
Cutler-Hammer
Daystrom Inst.
Dietz Co., Henry G.
Eagle Signal Corp.
Electric Techometer
Edison Instrument Div.
Electronic Controls
Electrosig Corp.
Electyme Motor Prods.
Emmett Machine
Farmer Electric Co.
Ferrara, Inc.
Fredericks Co., Geo.
General Control (Mass.)
General Controls
GE Apparatus Sales
GE Instrument Dept.
Guardian Elec. Mfg. Co.
G-V Controls
Haledy Electronic Co.
Hansen Co.
Haydon Co., A. W.
Haydon Mfg. Co.
Humphreys, Inc.
Hycon Mfg. Co.
Industrial Timer
International Register
International Research
Johnson Service
Kopp Scientific
Lumenite Electronic
Lux Clock Mfg. Co.
Mallory & Co.
Masco Products
Mason-Nielan Regulator
Miller-Harris Inst.
National Time & Signal
New Haven Clock
Paragon Electric Co.
Partlow Corp.
Perfex Div.
Photovolt Corp.
Pneu-Trol Devices
Post Machinery
Potter & Brumfield
Potter Instrument
Precision Scientific
Rhodes Inc., M. H.
Rutherford Electronics
Seely Inst. Co., Inc.
Sessions Clock Co.
Sinclair-Collins Valve
Square D Co.
Stoelting Co.
Stromberg Time Corp.
Struthers-Dunn
Taylor Inst. Cos.
Thompson Clock Co.
Timetrol Co.
Ulanet Co., Geo.
Walkirt Co.
Walser Automatic Timer
Weston Elec. Inst.
Westport Electric
Wilson & Co., G. C.
Yellow Springs Inst. Co.
Zenith Electric

TIMERS, AUTOMATIC, Cycle

Abrams Instrument
Alina Corp.
Am. Gas Accumulator
Amglo Corp.
Assembly Products
Atomic Instrument
Autocall Co.
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Temp. Control
Barber-Colman
Becker Co., Richard F.
Berkeley Scientific Div.
Betts & Betts
Bill Jack Scientific
Bristol Co.
Bristol Motor Div.
Clark Cooper Co.
Climax Div.
Cook Electric
Counter & Control Corp.
Cramer Co., Inc.
Cutler-Hammer
Daystrom Inst.
Devtronics, Inc.
Dietz Co., Henry G.
Eagle Signal Corp.
Eclipse-Pioneer Div.
Electric Tachometer
Electronic Controls
Electronics Corp. of Amer.
Electrosig Corp.
Electro-Tech Equip. Co.
Electyme Motor Prods.
Elgin-Neomatic, Inc.
El-Mec Laboratories
Emmet Machine
Engineering Res. & Dev.
Farmer Electric Co.



ANY TIMING CYCLE WITH BECKER "ADD-A-CYCLE" . . .

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MODEL AFC shows 6 plug-in units with various cycling timers.

RICHARD F. BECKER CO. . . . *Timing Devices*
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Ferrara, Inc.
Fisher Governor
Fisher-Pierce Co.
Foxboro Co.
Fredericks Co., Geo.
General Control (Mass.)
GE Apparatus Sales
GE Instrument
Glass Engineering Labs.
Gordon Enterprises
Gotham Intrument Div.
Gray Instrument
Hagan Corp.
Haleday Electronic Co.
Hansen Co.
Haydon Co., A. W.
Haydon Mfg. Co.
Humphreys, Inc.
Industrial Timer
Industrol Corp.
International Instrument
International Register
Johnson Service
Lumenite Electronic
Mallory & Co.
Masco Products
Miller, M. C.
Miller-Harris Inst.
Minneapolis-Honeywell
Montgomery Mfg. Co.
National Time & Signal
New Haven Clock
Newmatic Corp.
Paragon Electric Co.
Partlow Corp.
Penn Electric Switch
Photovolt Corp.
Post Machinery
Potter Instrument
Richardson Allen
Sangamo Electric Co.
Seely Inst. Co., Inc.
Sessions Clock Co.
Sinclair-Collins Valve
Standard Elec. Time
Stoelting Co.
Stromberg Time Corp.
Struthers-Dunn
Taylor Inst. Cos.
Telechron Dept.
Timetrol Co.
Thompson Clock Co.
Thordarson-Meissner
Tork Clock Co.
Walkirt Co.
Walser Automatic Timer
Westinghouse Elec.
Weston Elec. Inst. Corp.
Westport Electric
Wheelco Div.
Wilson & Co., G.C.
Yellow Springs Inst. Co.
Zenith Electric

TIMERS, AUTOMATIC, Interval

Abrams Instrument
Aero Instrument
Alina Corp.
Allen-Bradley Co.
Amer. Chronoscope
Am. Gas Accumulator
Amglo Corp.
Anderson, A. & J. M.
Atomlab, Inc.
Automatic Elec. Chicago
Automatic Elec. Mfg.
Automatic Temp. Control
Barber-Colman
Bar-Ray Products, Inc.
Berkeley Scientific
Betts & Betts
Bill Jack Scientific
Bristol Co.
Bristol Motor Div.
Chicago Surgical & Elec.
Cincinnati Time Rec.
Clark Controller Co.
Clark Cooper Co.
Control Engr. Co.
Cook Electric
Cramer Co., Inc.
Devtronics, Inc.
Dietz Co., Henry G.
Dimco-Gray Co.
Dirigo Compass & Inst.
Eagle Signal Corp.
Eclipse-Pioneer
Electric Tachometer
Electronic Control
Electro Products Lab.
Electronics Corp. of Am.
Electrosig Corp.
Electyme Motor Prods.
Elgin-Neomatic, Inc.
Engineering Res. & Dev.
Engler Inst.
Farmer Electric Co.
Ferrara, Inc.
Fisher-Pierce Co.
Fredericks Co., Geo.
Gaertner Scientific
General Control (Mass.)
GE Apparatus Sales
GE Instrument Dept.
General Electric X-Ray
Glogau & Co.
Gordon Enterprises
Gorrell & Gorrell
Gray Instrument
Guardian Elec. Mfg.
Hansen Co.
Harvey Radio Labs.
Haydon Co., A. W.
Haydon Mfg. Co.
Heiland Div.
Humphreys, Inc.
Hycon Mfg. Co.
I-L-S Instrument
Industrial Timer Corp.
International Register
Labline, Inc.
Leeds & Northrup
Liebel-Flarsheim Co.
Lumenite Electronic
Lux Clock Mfg. Co.
Mallory & Co.
Masco Products
Miller-Harris Inst.
Minneapolis-Honeywell
Montgomery Mfg. Co.
National Time & Signal
New Haven Clock
Newmatic Corp.
Norden-Ketay Corp.
NRD Instruments
Paragon Electric Co.
Partlow Corp.
Perfex Corp.
Photovolt Corp.
Post Machinery
Potter Instrument
Potter & Brumfield
Production Inst. Co.
RCA Tube
Revere Corp.
Rhodes, Inc.
Richardson-Allen
Sangamo Electric
Seely Inst. Co.
Serdex Co.
Shepard Laboratories
Sinclair-Collins Valve
Skaneateles Mfg. Co.
Soreng Products
Standard Elec. Time
Stoelting Co., C. H.
Stromberg Time Corp.
Struthers-Dunn
Sunshine Scientific
Taylor Instrument Co.
Telechron Dept.
Thomas Clock Co.
Thompson Clock Co.
Thordarson-Meissner
Timetrol Co.
Tork Clock
Vacuum Tube Prods.
Walkirt Co.
Walser Automatic Timer
Weston Elec. Inst.
Westport Electric
Wilson & Co., G. C.
Yellow Springs Inst. Co.
Zenith Electric

TIMERS, AUTOMATIC Process

Alfax Paper & Eng.
Alina Corp.
American Time Corp.
Amglo Corp.
Auth Elec. Spec.
Autocall Co.
Automatic Elec. Chicago
Automatic Electric Mfg.
Automatic Temp. Control
Barber-Colman
Betts & Betts
Bristol Co.
Bristol Motor Div.
Cincinnati Time Rec.
Clark Cooper Co.
Cook Electric
Counter & Control Corp.
Cramer Co., Inc.
Cutler-Hammer
Daystrom Inst.
Denver Fire Clay
Dietz Co., Henry G.
Dimco-Gray Co.
Eagle Signal Corp.
Electronic Controls
Electronic Prod. Co.
Electronics Corp. of Am.
Electyme Motor Prods.
Elgin-Neomatic, Inc.
El Mec Laboratories
Emmett Machine
Farmer Electric Co.
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Foxboro Co.
Fuel Watchman
Gaertner Scientific Corp.
General Control (Mass.)
GE Apparatus Sales
GE Instrument Dept.
Genisco Inc.
Gotham Instrument Div.
Gray Instrument
Hagan Corp.
Hansen Co.
Haydon Co., A. W.
Hycon Mfg. Co.
Industrial Timer Corp.
International Register
Jardur Import
Koehler Instrument
Lumenite Electronic
Magnetic Gauge Co.
Mallory & Co.
Masco Products
Miller-Harris Inst.
Minneapolis-Honeywell
Montgomery Mfg. Co.
National Time & Signal
New Haven Clock
Newmatic Corp.
Paragon Electric Co.
Partlow Corp.
Photovolt Corp.
Post Machinery
Potter & Brumfield
Potter Instruments Co.
Powers Regulator Co.
Richardson-Allen
Seely Inst. Co., Inc.
Serdex, Inc.
Sinclair-Collins Valve
Standard Elec. Time
Stoelting Co., C. H.
Stromberg Time Corp.
Struthers Dunn
Taylor Inst. Cos.
Telechron Inc.
Thompson Clock
Thordarson-Meissner
Timetrol Co.
Tork Clock Co.
Walkirt Co.
Wallace & Tiernan
Walser Automatic Timer
Weston Elec. Inst. Corp.
Wilson & Co.
Zenith Electric

TIMERS, AUTOMATIC, Spot Weld

Allen-Bradley Co.
Am. Gas Accumulator
Automatic Temp. Control
Booth Co., Arthur E.
Cramer & Co., Inc.
Cutler-Hammer, Inc.
Dietz Co., Henry G.
Electronic Controls
Electronic Prods. Co.
Electronics Corp. of Am.
Electyme Motor Prods.
Elgin-Neomatic, Inc.
Farmer Electric Co.
Federal Tool Eng'ng.
General Control (Mass.)
GE Apparatus Sales
Industrial Timer
Lumenite Electronic
National Time & Signal
New Haven Clock
Photovolt Corp.
Square D Co.
Timetrol Co.
Vacuum Tube Prods.
Wilson & Co., G. C.

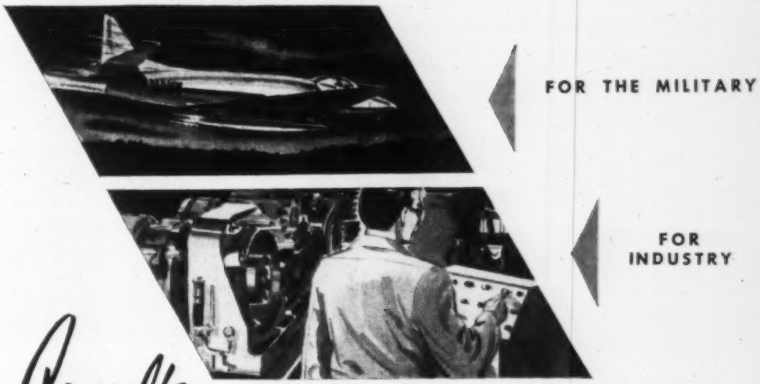
TITRATION APPARATUS, Electrometric

Ace Glass Inc.
Beckman Instruments
Burrell Corp.
Cambridge Instrument Co.
Central Scientific Co.
Coleman Electric Co.
Deltron, Inc.
Electro-Physics
Fisher Scientific Co.
Gray Instrument
Hallikainen Inst.
International Instrument
Kacour Co.
Leeds & Northrup Co.
Macbeth Corp.
Micro-Metric Inst.
Milton-Roy Co.
Pfaltz & Bauer
Precision Scientific
Rubicon Co.
Sargent & Co., E. H.
Shasta Div.
Technical Equip. Co.
Thomas Co., Arthur H.
Thwing-Albert Inst.
Welch Scientific

TOOLMAKER'S FLATS (See Flats, Optical)

TOOLS, Precision

Acromark Co.
Alden Products
Baker Products
Barbour Stockwell
Bayside Watch Tool



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FOR THE MILITARY

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Design and Manufacture of Electro-Mechanical Timing Devices

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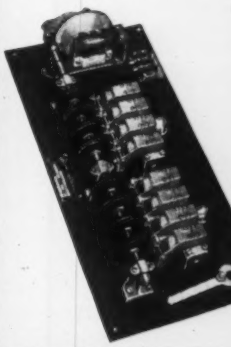
For more information circle **366** on inquiry card.



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at 1 to 80 psi.

flexible sequence control

dependable, simple, sturdy

atc®

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Represented in Canada by: Powerlite Devices, Ltd., Toronto, Montreal and Vancouver

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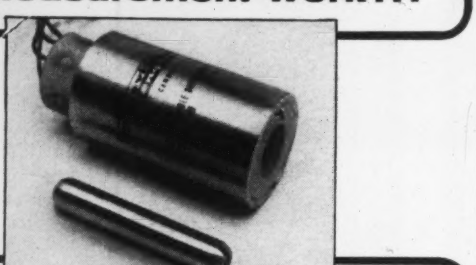

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SCHAEVITZ LVDT's are used for a wide variety of applications in many different industries because they are sensitive, very accurate instruments for producing a voltage proportional to linear displacement. There is no friction since core and coil are separate units and they are easy to mount without critical alignment.

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Daco Machine & Tool
Dearborn Gage
Engineering Res. & Dev.
Engis Equipment
Ercona Corp.
Fonda Gage Co.
Gaunt Industries
Gustafson Mfg. Co.
Jadow, Inc. B.
Jerpbak-Bayless Co.
Levin & Son
Lufkin Rule Co.
Marshall Co.
Millers Falls Co.
Mitchell Scientific
Newall Mfg. Co.
Scherr Co., Inc.
Standard Products
Starrett Co., L. S.
Sturdy Tool & Gage
Woodruff & Stokes

TOPOGRAPHIC INSTRUMENTS (See Surveying Instruments

TORQUE GAGES (See Gages, Torque)

TORQUE MEASURING EQUIPMENT
Aero Electronics
Airdraulics Engineering
Ann Arbor Inst. Works
Avion Div.
Baldwin-Lima-Hamilton
B & F Instruments
Brush Electronics Co.
Clark Mfg. Co.
Control Engg. Co.
Doelcam Div.
Emery Co., A. H.
Ercona Corp.
Flight Research Eng.
Foxboro Co.
G E Apparatus Sales
Gilmore Industries
Hagan Corp.
Hathaway Instrument
Industrial Electronics
Industrial Engineering
Jo-Line Tools
Kahn & Co.
Martin-Hubbard Corp.
Polyphase Instrument
Revco Inc.
Richmont, Inc.
Ruge-de Forest, Inc.
Saxl Instrument
Skyway Prec. Tool
Sturtevant Co.
Sunshine-Scientific
Testing Machines, Inc.
Trimount Inst. Co.
Vectron, Inc.

TORQUE WRENCHES (See Wrenches, Torque)

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Aero Electronics
Baldwin-Lima-Hamilton
Commercial Research
Consolidated Engg.
Hamilton Watch
Saxl Instrument
Toledo Scale Co.

TORSION METERS
Aero Electronics
Airdraulics Engineering
Boulin Inst. Corp.
Chatillon & Sons
Commercial Research
Epic Inc.
Hathaway Inst. Co.
Riehle Testing Machines
Saxl Instrument
Sturtevant Co.
Toledo Scale Co.

TOTALIZERS, Demand
American Meter Co.
Berkeley Scientific Corp.
Esterline-Angus
G E Apparatus Sales
Landis & Gyr
Leeds & Northrup
Metrotype Corp.
Sangamo Elec.
Westinghouse Elec.

TOTALIZERS, Electric Energy
Autocall Co
Automatic Elec. Chicago
Bristol Co.
Esterline Angus Co.
G E Apparatus
Landis & Gyr
Leeds & Northrup
Metrotype Corp.
Sangamo Electric
Streeter-Amet. Corp.
Westinghouse Elec.

TOTALIZERS, Fluid Flow
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Askania Regulator Co.
Bailey Meter Co.
Bendix Aviation Corp.
Berkeley Scientific
Bristol Co.
Brooks Rotameter
Builders-Providence
Eclipse Pioneer Div.
Engineering Res. & Dev.
Fischer & Porter
Foxboro Co.
General Elec. Co.
Hagan Corp.
Hays Corp.
Henszey Co.
Industrial Inst.
International Instrument
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National Inst. Labs.
Norden-Ketay
Penn Ind. Inst. Corp.
Potter Aeronautical
Republic Flow Meters
Revere Corp.
Simplex Valve & Meter
Smith Meter
Sparling, R. W.
Streeter-Amet Co.
Taylor Inst. Cos.
Weston Elec. Inst.

TOTALIZERS, Gas Flow
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Bailey Meter Co.
Bristol Co.
Brooks Rotameter
Builders-Providence
Fischer & Porter
Foxboro Co.
Hagan Corp.
Hays Corp.
Industrial Inst.
Minneapolis-Honeywell
Penn Ind. Inst. Corp.
Republic Flow Meters
Simplex Valve & Meter
Streeter-Amet Co.

TOTALIZERS, Running Time
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Berkeley Scientific Div.
Bristol Co.
Cramer Co., Inc.
Doelcam Div.
Elec. Tachometer Corp.
General Electric
Gorrell & Gorrell
Haydon Mfg. Co.
Industrial Timer Corp.
Lumenite Electronic
Marion Electrical Inst.
Presin Co.
Production Instrument
Standard Elec. Time
Stewart Instrument
Streeter-Amet Co.
Westinghouse Elec. & Mfg.

TRAFFIC SIGNALING DEVICES (See Signaling Devices, Traffic)

TRAMMELS, Steel Beam
Brown & Sharpe
Lufkin Rule Co.
Starrett Co., L. S.

"TRANSDUCERS" (Note: a transducer converts one form of POWER into another. For numerous primary measuring elements incorrectly called "transducers," see the correct headings under the measurables, the Instruments, etc.)

TRANSDUCERS, Ultrasonic
Atlantic Research
Bendix Aviation Corp.
Beta Corp.
Branson Instruments, Inc.
Chesapeake Inst. Corp.
Electronics Co.
Electro-Mec Lab.
Electro Products Labs.
Dyna-Labs
G E Apparatus Sales
Gen. Precision Lab.
General Ultrasonics
Gulton Mfg. Co.
Hewlett-Packard
Knights Co.
Laboratory for Electronics
Massa Labs.
Monsell, J. R.
Norden-Ketay Corp.
Pacific Div.
Premier Research
Raytheon Mfg. Co.
Reed Research
Rutico, Inc.
Sangamo Electric
Sperry Products
Vibro-Ceramics

TRANSFORMERS, Adjustable
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Airdesign, Inc.
Allied Control Co.
Atlas Engineering
Basler Electric
Better Coil & Transformer
Burrell Corp.
Cambridge Thermionic
Carad Corp.
Claude Neon
Chicago Transformer
Dormitzer Elec. & Mfg.
Electronic Transformer Co.
Freed Transformer
G E Apparatus Sales
General Radio Co.
Gramer-Halldorson
Hevi Duty Elec.
Langevin Mfg. Co.
Lindberg Air
Microtran Co.
Miller Transformer
Raytheon Mfg. Co.
Sorensen & Co.
Standard Piezo
Sterling Transformer
Superior Electric Co.
Tartak Electronics, Inc.
Thermador Electrical
Thordarson-Meissner
Trenton Transformer
United States Electronic
United Transformer
Westinghouse X-Ray Co.

TRANSFORMERS, Constant Voltage
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Airdesign Inc.
Atlas Engineering
Basler Electric
Berkshire Transformer
Better Coils & Transformer
Boonton Radio Corp.
California Magnetic
Carad Corp.
Chicago Electronic
Cutler-Hammer Inc.
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Electrosig Corp.
Federal Telephone
G E Apparatus Sales
General Controls
Hevi-Duty Elec.
Magnetic Amplifiers
Magnetic Instrument
Magnetic Research
Microtron Co.
Miller Transformer
New London Inst.
Perkin Engineering
Raytheon Mfg. Co.
Sola Electric Co.
Sorensen & Co.
Square D Co.
Standard Transformer
Superior Electric Co.
Thordarson-Meissner
Transformers, Inc.
United Transformer
Varo Mfg. Co.
Westinghouse Elec.
Westinghouse X-Ray Co.
Weston Elec. Inst.

TRANSFORMERS, High Frequency
Acme Electric
Aircraft Transformer
Cambridge Thermionic
C. G. S. Labs.
Communication Access.
Freed Transformer Co.
GE Apparatus Sales
Lear, Inc.
Levinthal Electronic Prod.
Moran Electronic Com.
Polyphase Instrument
Raytheon Mfg. Co.
Sangamo Electric
Texas Instruments
Westinghouse Elec.

TRANSFORMERS, Impedance
Acme Electric
Aircraft Transformer
Airpax Products
Atlas Engineering
Audio Development Co.
Ballastran Corp.
Basler Electric
Berkshire Transformer
Better Coil & Transformer
California Magnetic
Carad Corp.
C. G. S. Labs.
Chapman Labs.
Chicago Transformer
Communications Accessories
Del Electronics
Dittmore & Freimuth
Dyna-Labs
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Femco, Inc.
Ferranti Electric
Freed Transformer Co.
G E Apparatus
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General Radio
Gramer-Halldorsen
Hansen Electronics
Hevi-Duty Electric Co.
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Hycor Co., Inc.
Keystone Products
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Linear Equip. Labs.
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Microtran Co.
Miller Transformer
New London Inst.
N.Y. Transformer
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PCA Electronics, Inc.
Polyphase Inst. Co.
Raytheon Mfg. Co.
Sangamo Electric
Sierra Electronics
Sonensen & Co.
Southwestern Inc. Elec.
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Thermador Electrical
Thordarson-Meissner
Transformer Engineers
Transformers, Inc.
Trenton Transformer
United States Electronics
United Transformer
Varo Mfg. Co.
Weston Elec. Inst.

TRANSFORMERS, Instrument
Acme Electric
Aeromarine Inst. Co.
Aircraft Transformer
Airdesign, Inc.
Allied Control Co.
Allis-Chalmers
Amplifier Co.
Annis Co., R. B.
Assembly Products
Associated Research
Atlas Engineering
Ballastran Corp.
Basler Electric
Berkshire Transformer
Better Coil & Transformers
Burlington Inst. Co.
Carad Corp.
Chapman Labs.
Chicago Electronic
Chicago Transformer
Columbia Elec. Mfg.
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Control Corp.
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Federal Telephone
Freed Transformer
Freiz Instrument Div.
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G E Instrument Dept.
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Hagan Corp.
HeviDuty Electric
Hickok Elec. Inst. Co.
Industrial Insts. Inc.
Instrument Laboratories
Karl-Douglas Assoc.
Kenyon Transformer
Keystone Products
Langevin Mfg. Corp.
Magnetic Instrument
Manning, Maxwell & Moore
Merit Transformer
Microtran Co.
Miller Transformer
Millivac Inst.
New London Instrument
New York Transformer
Nuclear Meas. Corp.
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Servomechanisms, Inc.
Sierra Electronic
Simpson Electric Co.
Sorensen & Co.
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Specialties, Inc.
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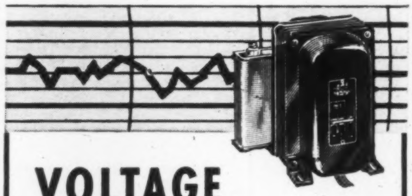
Square D. Co.
Standard Science Sup.
Standard Transformer
Sterling Transformer
Sticht Co.
Superior Electric Co.
Sylvania Elec. Prod.



VOLTAGE REGULATING TRANSFORMERS

Static-magnetic regulators provide automatic, instantaneous voltage regulation within ±1% regardless of primary voltage swings of 30%. No moving parts . . . no manual adjustments . . . self-protecting against short circuit. Five general types, 42 standard units cover most requirements. Custom-design stabilizers for specific requirements available in production quantities.

For further information request Bulletin 30G-CV200

SOLA *Constant Voltage* TRANSFORMERS

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4633 W. 16th St., Chicago 50

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Texas Instruments
Thermador Electrical
Thordarson-Meissner
Transformer Engineers
Transformers, Inc.
Trenton Transformer
United Optical Mfg.
United States Electronics
United Transformer Corp.
Varo Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.

TRANSFORMERS, Insulation Testing

Acme Electric
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Airdesign, Inc.
Airpax Products
Associated Research
Atlas Engineering
Ballastran Corp.
Basler Electric
Berkshire Transformer
Better Coils & Transformers
Campbell Electric
Chapman Labs.
Chicago Electronic
Claude Neon
Del Electronics
Electronic Transformer Co.
Ferranti Electric
Freed Transformer
G E Apparatus Sales
General Controls
Gramer-Halldorson
Hevi-Duty Electric Co.
Langevin Mfg. Corp.
Lenkurt Electric Co.
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Miller Transformer
New Jersey Electronics
Peschel Electronics
Precise Measurements
Raytheon Mfg. Co.
Sherron Metallic
Sierra Electronic
Spellman TV Corp.
Standard Transformer
States Co.
Sterling Transformer
Superior Electric Co.
Tartak-Electronics, Inc.
Thermador Electrical
Thordarson-Meissner
Transformer Engineers
Trenton Transformer
United Transformer

TRANSFORMERS, Laboratory

Acme Electric
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American Transformer
Amplifier Co.
Atlas Engineering
Audio Development
Ballastran Corp.
Basler Electric
Berkshire Transformer
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Chicago Electronic
Clough Brengle Co.
Computer Eng'ng
Daven Co.
Daystrom Inst.
Del Electronics
Dittmore & Freimuth
Eastern Specialty Co.
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Electro-Tech Equip. Co.
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GE Apparatus Sales
General Controls
General Radio Co.
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Microtime Labs.
Miller Transformer
New London Inst. Co.
New York Transformer
Osborne Electric
PCA Electronics Inc.
Perkin Engineering
Raytheon Mfg. Co.
Sangamo Electric
Scientific Glass App.
Sierra Electronic
Sola Electric Co.
Sorensen & Co.
Southwestern Ind. Elec.
Standard Elec. Prod.
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Sterling Transformer
Superior Electric Co.
Tartak-Electronics Inc.
Thermador Electrical
Thordarson-Meissner
Torwico Electronics
Transformer Engineers
Transformers, Inc.
Trenton Transformer
United Transformer Corp.
Universal Scientific
Westinghouse Electric
Weston Elec. Inst. Corp.

TRANSFORMERS, Microwave

Acme Electric
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Basler Electric
Berkshire Transformer
Better Coil & Transformers
Carad Corp.
Chicago Transformer
F. R. Machine Works
Freed Transformer
General Electric Co.
Gramer-Halldorson
Hycon Mfg. Co.
Keystone Products
Lectronic Res.
Maxson Corp., W. L.
Raytheon Mfg. Co.
Sperry Gyroscope Co.
Sorensen & Co.
Sterling Transformer
Thordarson-Meissner
United Transformer
Vectron, Inc.
Viking Electric

TRANSFORMERS, Phasing

Acme Electric
Aircraft Transformer
Airdesign, Inc.
Atlas Engineering
Audio Development
Ballastran Corp.
Basler Electric
Berkshire Transformer
Better Coil & Transformers
California Magnetic
Chapman Labs.
Chicago Transformer
Eastern Specialty Co.
Electrical Facilities
Electronic Transformer Co.
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Transformer Engineers
Transformers, Inc.
Trenton Transformer
United Transformer Corp.
Varo Mfg. Co.
Viking Electric
Westinghouse Electric
Weston Elec. Inst.

TRANSFORMERS, Power

Acme Electric
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Airdesign, Inc.
Airpax Products
Allied Control Co.
Allis-Chalmers
American Transformer
Amplifier Co.
Atlas Engineering
Audio Development
Ballastran Corp.
Basler Electric
Berkshire Transformer
Better Coil & Transformer
California Magnetic
Chapman Labs.
Chicago Electronic
Chicago Transformers
Claude Neon
Comar Elec. Co.
Del Electronics
Dittmore & Freimuth
Dormitzer Elec. & Mfg.
Eclipse-Pioneer Div.
Electrical Facilities
Electronic Transformer Co.
Federal Telephone
Femco, Inc.
Ferranti Electric
Freed Transformer
General Controls
GE Apparatus Sales
Gramer-Halldorson
Harvey Radio Labs.
Hevi Duty Electric
Islip Radio Mfg.
James Vibrapower
Kenyon Transformer
Keystone Products
Langevin Mfg. Corp.
Lenkurt Electric Co.
Lindberg Air
Magnetic Amplifiers
Magnetic Instrument
Merit Transformer
Microtran Co.
Miller Transformer
Moran Electronic
Multi-Amp
New Jersey Electronics
New London Inst. Co.
New York Transformer
Opad Electric
Osborne Electric
PCA Electronics, Inc.
Perfex Corp.
Perkin Engineering
Raytheon Mfg. Co.
RCA Tube
Sangamo Electric
Servo Corp.
Sola Electric Co.
Soreng Products
Sorensen & Co.
Square D Co.
Standard Transformer
Sterling Transformer

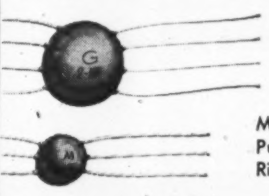
RELIABILITY
ECONOMY
VARIETY

MILITARY
COMMERCIAL

DELAY LINES
PULSE
TRANSFORMERS

We specialize in
Pulse Forming and
Timing Components

WE SHOW
A FEW . . . OF MANY



PULSE TRANSFORMERS

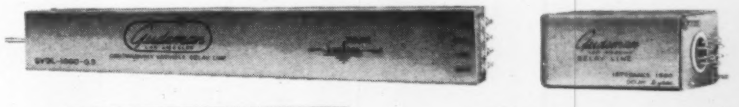
PULSE WIDTHS: from .05 to 100 microseconds
RISE TIMES: from .005 to 2 microseconds
WINDINGS: 2, 3 or 4 (with or without taps)

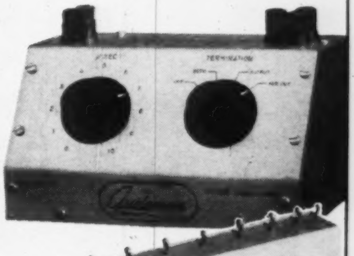
TYPICAL SPECIFICATIONS

Model No. M.1-11
Pulse Width .1 microsecond
Rise Time .005 microsecond
Test Voltage 2000 V RMS
Weight less than .03 ounce
Size 11/32" diameter
Operating Temp. Range: –70°C to 135°C

All models are Epoxy impregnated and
encapsulated or hermetically sealed to
meet military environmental requirements

Custom units for operation to 210°C

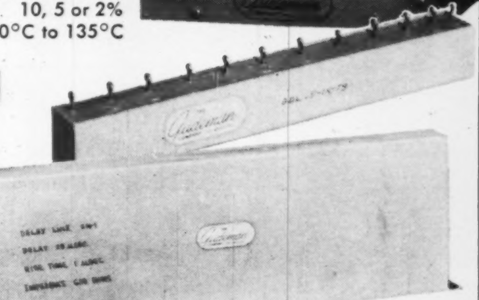




DELAY LINES

Distributed and lumped parameter
SPECIFICATION RANGE

Delay: .01 to 200 microseconds
Rise Time: 10% or less
Characteristic Impedance: 50 to 3300 ohms
Ripple Content: 10, 5 or 2%
Operating Temp. Range: –70°C to 135°C



PULSE FORMING
NETWORK

TO YOUR SPECIFICATIONS

Your inquiries regarding specific
applications are invited. Quotations will
be made without obligation.

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Gudeman
COMPANY OF CALIFORNIA INC

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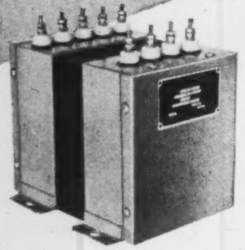
For more information circle **370** on inquiry card.



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Electronic Division

SEVEN LEAGUES AHEAD

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Sylvania Elec. Prod.
Tartak Electronics, Inc.
Texas Instruments
Thermador Electrical
Thordarson-Meissner
Transformer Engineers
Transformers, Inc.
Trenton Transformer
United Transformer
Varo Mfg. Co.
Viking Electric
Westinghouse Elec.
Weston Elec. Inst.

TRANSFORMERS, Pulse (See Pulse Transformers)

TRANSFORMERS, Split Core
Aircraft Transformer
Airdesign, Inc.
Airpax Products
Allied Radio Corp.
Annis Co., R. B.
Assembly Products
Atlas Engineering
Ballastran Corp.
Basler Electric
Berkshire Transformer
Better Coil & Transformer
California Magnetic
Carad Corp.
Chapman Labs.
Chicago Electronic
Chicago Transformer
Elec. Facilities, Inc.
Electronic Transformer Co.
Esterline-Angus Co.
Freed Transformer
GE Apparatus Sales
Gramer-Halldorson
H-D Elec. Co.
Islip Radio Mfg.
Karl-Douglas Assoc.
Kenyon Transformer
Keystone Products
Langevin Mfg. Corp.
Magnetic Amplifiers
Magnetic Instrument
Microtran Co.
New York Transformer
Osborne Electric
PCA Electronics, Inc.
Physics Research
Raytheon Mfg. Co.
Roller-Smith Co.
Rubicon Co.
Sangamo Electric Co.
Sorensen & Co.
Southwestern Ind. Elec.
Standard Transformer
Sterling Transformer
Sylvania Elec. Prod.
Tartak-Electronics, Inc.
Thermador Electric
Thordarson-Meissner
Trenton Transformer
United Transformer Corp.
Viking Electric
Westinghouse Elec.

TRANSFORMERS, Variable Voltage Testing
Acme Electric
Aircraft Transformer
Airdesign, Inc.
Allied Control Co.
Atlas Engineering
Basler Electric
Berkshire Transformer
Better Coil & Transformer
Chicago Electronic
Chicago Transformer
Claude Neon
Dormitzer Elec. & Mfg.
Electronic Transformer
Electrosig Corp.
Federal Telephone
Freed Transformer
General Electric Co.
General Radio Co.
Gramer-Halldorson
Hevi-Duty Electric Co.
Langevin Mfg. Corp.
Magnetic Instrument
Merit Transformer
Miller Transformer
Multi-Amp
Pacific Transducer Corp.
Perkin-Elmer
Phen-Trols, Inc.
Precise Measurements
Raytheon Mfg. Co.
Sola Electric
Sorensen & Co.
Standard Transformer
States Co.
Sterling Transformer
Superior Electric
Sylvania Elec. Prod.
Thermador Electrical
Thordarson-Meissner
Trenton Transformer
U. S. Electronics
United Transformer
Weston Elec. Inst.

TRANSFORMERS, Voltage Regulating
Acme Electric
Aircraft Transformer
Airdesign, Inc.
Allied Radio Corp.
Allis-Chalmers
Amplifier Co.
Atlas Engineering
Basler Electric
Better Coils & Transformers
Boonton Radio Corp.
Carad Corp.
Chicago Transformer
Claude Neon
Davis & Co., Inc., Dean
Electronic Transformer
Electrosig Corp.
Federal Telephone
GE Apparatus Sales
Gramer-Halldorson
Hevi Duty Electric
Keystone Products
Magnetic Amplifiers
Magnetic Instrument
Magnetic Research
Martin & Co.
Microtran Co.
Miller Transformer
N. Y. Transformers
Pacific Transducer Corp.
Perkin Engineering
Raytheon Mfg. Co.
Sola Electric Co.
Sorensen & Co.
Standard Transformer
Superior Electric
Sylvania Elec. Prod.
Thordarson-Meissner
Transformer Engineers
Transformers Inc.
Trenton Transformer
U.S. Electronics
United Transformer Corp.
Westinghouse Elec.

TRANSISTOR TESTING SETS (See Testing Sets, Transistor)

TRANSISTORS
Amperex Electronic Corp.
Bendix Red Bank Div.
CBS-Hytron
Electronic Div., GE
General Transistor
Germanium Prods.
Hughes Aircraft
Hydro-Aire Inc.
Industro, Inc.
International Std. Trading
Mallory & Co., P.R.
Minneapolis-Honeywell
Opplem Co.
Pacific Semiconductors
Radio Receptor Co.
Raytheon Mfg. Co.
Sprague Electric
Texas Instruments
Transistor Products

TRANSITS, Engineer's (See Surveying Instruments)

TRANSITS, Pocket
Ainsworth & Sons
Berger & Sons
Dietzgen Co.
Garlynn Engrg.
Graf-Apsco
Gurley, W.&L.E.
Keuffel & Esser Co.
Leupold & Stevens
Mico Instrument Co.
Suverkrop Instruments
United States Blue Print
Warren Knight Co.
White Co., Inc.
Wild Heerbrugg

TRUCK MILEAGE RECORDERS (See Meters, Mileage)

TRUCK-TIME RECORDERS
Impactograph Corp.
Matisa Equipment
Sangamo Electric
Service Recorder Co.
Streeter-Amet Co.
U. S. Taximeter

TRUCK, TIME & MILEAGE RECORDERS
Cramer & Co., Inc.
Engler Inst. Co.
Matisa Equipment
Sangamo Electric Co.
U.S. Taximeter

TUBE FITTINGS
Alden Products
Autoclave Engineers
Conax Corp.
Couse & Bolton Co.
Crawford Fitting Co.
Dorr-Patterson Engrg.
Imperial Brass Co.
Metal Goods Corp.
Moore & Co.
Parker Appliance Co.
Scovill Mfg. Co.
Special Screw Products
Weatherhead Co.
Wiggins Oil Tool Co.

TUBES (See Gas & Vapor Discharge Tubes)

TUBES, Cathode Ray (See Cathode Ray Tubes)

TUBES, Nessler (See Nessler Tubes)

TUBES, Oil Centrifuge (See Oil Centrifuge tubes)

TUBES, Geiger
Amperex Electronic Corp.
Atomic Instrument Co.
Detectolab, Inc.
Electronic Products
Forro Scientific
G.E. Electronics Division
Industro, Inc.
Leighton Labs.
North American Philips
NRD Instrument
Nuclear Inst. & Chem.
Nucleonic Co. of America
Radiation Counter Labs.
Raytheon Mfg.
R-C Scientific Inst.
Universal Atomics Corp.
Wood Counter Lab.

TUBES, Ignitron
Amperex Electronics Corp.
Industro, Inc.
Lectronic Research
North American Phillips Co.
Sylvania Electric Products

TUBES, Klystron
Amperex Electronics Corp.
Arrow Electronics
Eitel-McCullough Inc.
GE Tube Dept.
Industro, Inc.
Lectronic Research
Marconi Instruments
Sylvania Electric Products
Varian Associates

TUBES, Magnetron
Amperex Electronic Corp.
Industro, Inc.
Lectronic Research
Marconi Instruments
Microwave Assocs. Inc.
North American Phillips Co.
Sylvania Electric Products

TUBES, Photoelectric
Continental Electric Co.
De-Tec-Tronic Corp.
DuMont Labs, Inc.
Electron-Radar Prod.
Farnsworth Electronics
GE Electronics Div.
General Scientific Co.
Instrument Dev. Labs.
Lectronic Research
Precise Measurements
RCA Tubes
Rudolph & Sons
Scientific Specialties
Tube Div., GE
Vacutron, Inc.
Walker-Jamieson, Inc.

TUBES, Pitot (See Flowmeters, Pitot Tube)

TUBES, Polariscope
American Inst. Co.
Bausch & Lomb Optical
Central Scientific Co.
Fecker, J. W.
Gaertner Scientific Corp.
Hellige, Inc.
Jarrell-Ash Co.
Koehler Instrument
Precision Scientific Co.
Rudolph & Sons
Sargent & Co., E. H.
Scientific Glass App.

TUBES, Precision Bore (See Precision Bore Glass Tubing)

TUBES, Pyrometer (See Thermocouple Wells)

TUBES, Spectrum (See Spectrum Tubes)

TUBES, Thyratron
Amperex Electronic Corp.
Arrow Electronics
Eitel-McCullough Inc.
Electrons, Inc.
Industro, Inc.
Lectronic Research
Sylvania Electric Products

TUBES, Ultra-Violet Light (See Light Sources)

TUBES, Vacuum
Airborne Instruments
Amperex Electronic
Anton Electronic Labs.
Bendix Red Bank Div.
CBS-Hytron
Central Scientific Co.
Chatham Electronics
Consolidated Vacuum
Continental Corp.
Continental Electric Co.
Cooper-Hewitt Elec.
Dunlee Corp.
Eclipse-Pioneer
Eitel-McCullough
Electronic Products Co.
Electrons, Inc.
Federal Telephone
Frederick Co., George
GE Electronics Div.
General Scientific Corp.
Huggins Labs
Industro, Inc.
International Std. Trading
Lectronic Research
Lewis & Kaufmann Ltd.
Machlett Labs.
Microwave Assocs., Inc.
North American Philips
Passaic Analytical Labs.
Philadelphia Scientific
Philco Corp.
Raytheon Mfg. Co.
RCA Tube
Ronar, Inc.
Scientific Glass App.
Standard Arcturus
Sorensen & Co.
Sperry Gyroscope Co.
Sylvania Elec. Prod.
Thermosen Inc.
Tube Div., GE
Tung-Sol Electric
United Electronics
Universal X-Ray Products
Vacutron Inc.
Vacuum Tube
Varian Associates
Victoreen Instrument
Walker-Jamieson, Inc.
Western Radiation
Wheelco Inst. Co.

TUBES, Venturi (See Flowmeters, Venturi)

TUBES, Voltage Regulator
Amperex Electronic Corp.
CBS-Hytron Div.
Electronic Products
Industro, Inc.
Lectronic Research
Philco Corp.
Raytheon Mfg. Co.

TUBES, X-Ray
American Inst. Co.
Amperex Electronic
Baird Associates
Corning Glass Works
Dunlee Corp.
Eureka X-Ray Tube
General Elec. X-Ray Dept.
High Voltage Eng.
Jarrell-Ash Co.
Kelley Koett Mfg.
Machlett Labs.
North Amer. Philips
Picker X-Ray
Ronar, Inc.
Standard Arcturus
Stoelting Co., C. H.
Universal X-Ray Prods.
Westinghouse Elec.
Westinghouse X-Ray Co.
Wyland George

TUBING, Air & Hydraulic
Aero-Coupling Corp.
Aeroquip Corp.
American Inst. Co.
Autoclave Eng'rs.
Bar-Ray Products, Inc.
Couse & Bolten Co.
Crescent Insulated Wire
Flexonics Corp.
Imperial Brass Mfg.
Moore & Co., Samuel
Okonite Co.
Precision Tube
Reynolds Metals
Superior Tube
Uniform Tube, Inc.
U. S. Stoneware
Viking Copper Tube

TUBING: Anticorrosion coatings for—
Crucible Steel Co. of Amer.
Samuel Moore
U. S. Stoneware

TUBING SUPPORTS (See Cable & Tubing Supports)

TUNING FORKS, Electrically Driven (See Forks, Tuning)

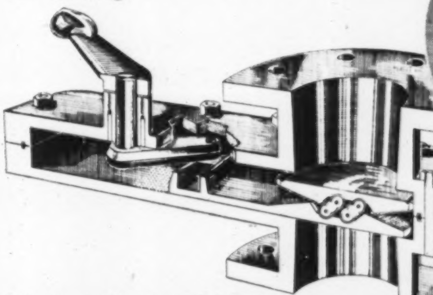
TURBIDIMETERS
American Inst. Co.
Boekel & Co.
Bowen & Co.
Cargille, R. P.
Central Scientific Co.
Electric Eye Equipment
Ercona Corp.
Ess Instrument Co.
Ferguson Co.
Fisher Scientific Co.
GE Apparatus Sales
GE Instrument Dept.
Hallikainen Inst.
Hellige, Inc.
Instrument Dev. Labs.
Klett Mfg. Co.
Kimble Glass Co.
Owens Illinois Glass
Parr Instrument Co.
Pfaltz & Bauer, Inc.
Phipps & Bird
Phoenix Precision Inst.
Photovolt Corp.
Precision Scientific Co.
Radioactive Products
Rawson Electrical Inst.
Rubicon Co.
Sensitive Research Inst.
Testing Machines, Inc.
Zeiss, Inc., Carl

TURN & BANK INDICATORS
Aeromarine Inst. Co.
Bendix Aviation Corp.
Burton Mfg.
Daystrom Inst.
Doelcam Div.
Eclipse-Pioneer Div.
General Electric
Kollsman Inst. Div.
Matisa Equipment
Republic Mfg. Co.
Schwien Engr. Co.
Summers Gyroscope

TURN INDICATOR TESTERS (See Testers, Turn indicator)

TWEEZERS, Instrument
Baker Co.
Bayside Watch Tool
Dixon, Inc., Wm.
Fisher Scientific
General Scientific Equip.
Graf-Apsco
Ideal Laboratory Tool
Jadow, Inc., B.
Lindly & Co.
Marshall Co.
Michrochemical Service
Micro-Metric Inst.
Park Sales Co.
Stratex Instrument Co.
Win Sales Co.

TWIST COUNTERS (See Counters, Twist)



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UNIQUE DESIGN

An entirely new design based on a unique principle has created a straight-through, quick-acting gate valve with outstanding features. Simple, rugged, efficient, light, easy-operating, and no contact between gate and seat until fully closed. Proved in high vacuum work to pressures lower than 10^{-6} mm Hg.

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- ☆ FULL CONTROL
- ☆ LONG LIFE
- ☆ POSITIVE SEAL
- ☆ LOW COST

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BAILEY

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• BAILEY ARMORTUBE cable, a flexible, protected, multi-tube transmission line, is used to carry pneumatic signals in telemetering and automatic control systems. It minimizes installation cost and provides inherent hazard-proof protection.

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1041 IVANHOE ROAD CLEVELAND, O.
Bailey Meter Company Ltd. Montreal, Canada

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ULTRA-VIOLET INDICATORS & RECORDERS
Beckman Instrument Co.
Consolidated Engg. Co.
Engelhard, Inc., Charles
Farrand Optical
General Electric Co.
Hanovia Chem. & Mfg. Co.
Kruger Instruments
Menlo Research
Nuclear Chicago
Phoenix Prec. Inst.
Photovolt Corp.
Process & Instruments

ULTRA-VIOLET LIGHT SOURCES (See Light Sources)

ULTRASONIC EQUIPMENT
Air Associates
Atlantic Research Corp.
Bendix Aviation, Pac. Div.
Branson Instruments
Chesapeake Instrument
Computer Control
ConRay Corp.
Corbett Science Labs.
Dice Co.
Dyna Labs., Inc.
Ercona Corp.
Fruengel, Inc.
General Ultrasonic
Genzlinger, Inc.
Gulton Mfg. Corp.
Industrial Gauges Corp.
Kahn & Co.
Kay Electric
Massa Labs., Inc.
Photocon Research
Radex Corp.
Raytheon Mfg.
Sperry Prods.
Sunshine Scien. Inst.
Ultrasonic Corp.
Ultrasonic Eng'ng. Co.

U-TUBE MANOMETERS (See Manometers)

VACUUM GAGES, Discharge
Bristol Co.
Consolidated Vacuum
Distillation Products
High Vacuum Equip.
National Research
RCA Div.
Skaneateles Mfg.
Universal X-Ray Prods.
U. S. Gauge
Vacuum Tube Prods.
Weksler Thermometer

VACUUM GAGES, Hot-Wire
Baird Associates
Consolidated Vacuum
Continental Elec. Co.
Distillation Products
Fredericks Co., Geo.
General Elec. Co.
General Physical Lab.
Hastings Instruments
High Vacuum Equip.
National Research
Process & Instruments
Universal X-Ray Prods.
Vacuum Tube Prods.
Victory Engr.
Winslow Co.

VACUUM GAGES, Ionization
Central Scientific Co.
Consolidated Engg. Co.
Consolidated Vacuum
Distillation Products
Eitel McCullough
El-Tronics, Inc.
Fredericks Co., Geo.
GE Apparatus Sales
GE Instrument Dept.
High Vacuum Equip.
National Research
Nuclear Chicago
Precision Scientific
Process & Instruments
RCA Div.
Stoelting Co., C. H.
Sylvania Electric Prod.
Tube Div., GE
Universal X-Ray Prods.
Vacuum Tube Prods.
Welch Scientific
Winslow Co.

VACUUM GAGES, Liquid-column
American Meter Co.
Amthor Testing Inst. Co.
Bacharach Industrial Inst.
Bailey Meter Co.
Bristol Co.
Consolidated Vacuum
Defender Inst. & Reg.
Distillation Products
Dwyer Mfg. Co.
Ellison Draft Gage
Ferguson Co.
Foxboro Co.
Gas Appliance Specialties
General Electric
Greiner Glassblowing Lab.
Ideal Lab. Tool
Jerguson Gage & Valve
King Engineering
Kontes Glass Co.
Liquidepth Indicators
Manning, Maxwell & Moore
Meriam Instrument
Moeller Inst. Co.
Norden-Ketay
Penberthy Injector
Phoenix Precision Inst.
Pioneer Instrument
Precision Thermometer
Scientific Glass Apparatus
Taylor Inst. Cos.
Technical Equip. Co.
Todd Scientific
Trerice Co.
Uehling Instrument Co.
Universal X-Ray Prods.
Wallace & Tiernan
Welch Scientific
Weston Elec. Inst.

VACUUM GAGES, McLeod
Ace Glass, Inc.
Central Scientific Co.
Consolidated Engg. Co.
Consolidated Vacuum
Continental Electric Co.
Distillation Products
Electronic Products Co.
Ferguson Co.
General Elec. Co.
General Physical Lab.
Greiner Glassblowing Lab.
Hays Corp.
Kontes Glass Co.
Macalaster Bicknell Co.
Perfex Corp.
Phoenix Prec. Inst.
Podbielniak, Inc.
Radiation Inst. Dev. Labs.
Scientific Glass Apparatus
Stoelting Co., C. H.
Stokes Machine Co.
Todd Scientific
Tube Div., GE
Universal X-Ray Prods.
Welch Scientific

VACUUM GAGES, Pirani Type
Central Scientific
Consolidated Engg. Co.
Consolidated Vacuum
Continental Electric
Distillation Products
Electron-Radar Prod.
Ferguson Co.
Fredericks Co., George
General Elec. Co.
General Physical Lab.
Macalaster Bicknell
National Research
Process & Instruments
Sylvania Elec. Prod.
Tube Div., GE
Universal X-Ray Prods.
Vacuum Tube Prods.
Victory Engr.
Welch Scientific
Winslow Co.

VACUUM GAGES, Thermocouple
Central Scientific
Consolidated Engg. Co.
Consolidated Vacuum
Distillation Products
Fredericks Co., George
GE Apparatus Sales
GE Instrument Dept.
Hastings Instruments
National Research
Process & Instruments
RCA Div.
Scientific Specialties
Sylvania Elec. Prod.
Universal X-Ray Prods.
Vacuum Tube Prods.
Welch Scientific
Winslow Co.

VACUUM HIGH (below 1 mu) CONTROLLERS, INDICATORS & RECORDERS
Askania Regulator Co.
Baird Associates
Consolidated Engng.
Consolidated Vacuum
Continental Elec. Co.
Distillation Products
Electronic Prod. Co.
Fredericks Co., Geo.
General Elec. Co.
General Physical Lab.
High Vacuum Equip.
Ideal Lab. Tool
National Research
Process & Instruments
Shallcross Controls
Stoelting Co., C. H.
Taylor Instrument Cos.
Universal X-Ray Prods.
Vacuum Elec. Engr.
Vacuum Tube Prods.
Weksler Thermometer
Welch Scientific

VACUUM, HIGH (below 500 mu) CONTROLLERS, INDICATORS, RECORDERS
Askania Regulator Co.
Conoflow Corp.
Consolidated Engg. Co.
Consolidated Vacuum
Distillation Products
Fischer & Porter
Fulton Sylphon Div.
General Electric
General Physical Lab.
Hastings Inst. Co.
High Vacuum Equip.
Ideal Lab. Tool
Kahn & Co.
Manning, Maxwell & Moore
Minneapolis-Honeywell
Moore Products

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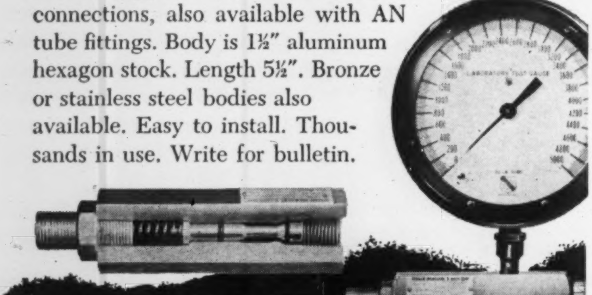

SPRAGUE
Engineering Corporation
1144 WEST 135TH STREET, GARDENA, CALIFORNIA

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Circle Seal valves provide the ultimate in quality—a combination of absolute leakproof sealing when closed, and virtually maintenance-free operation.

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Check valves for virtually any type of service at pressures as high as 10,000 psi as well as ultra-sensitive valves for very low-pressure systems.

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Relief valves for precise, dependable control of pressure and protection of equipment. Do not leak, do not stick.

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Manual shut-off valves incorporating O-ring seal for dead tight shut-off. For gas or liquid service to 3000 psi.

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Process & Instruments
Skaneateles Mfg.
Taylor Inst. Cos.
Technical Equip Co.
Universal X-Ray Products
Vacuum Tube Prods.
Winslow Co., Inc.

VACUUM INDICATORS

Aeromarine Inst. Co.
American Meter Co.
Ashton Valve Co.
Bailey Meter Co.
Baird Associates
Bristol Co.
Central Scientific Co.
Distillation Products
Engineering Res. & Dev.
Foxboro Co.
Fredericks Co., George
General Elec. Co.
General Physical Lab.
Gotham Inst. Div.
Hastings Instruments
Hays Corp.
Kollsman Inst. Div.
Manning, Maxwell & Moore
Marsh Corp.
Mason-Neilan Regulator
Meriam Instrument
Minneapolis-Honeywell
Moeller Instrument Co.
National Research
Potter Co.
Precision Scientific
Precision Therm.
Process & Instruments
Rawson Electrical Inst.
Republic Flow Meters
Rochester Mfg. Co.
Schauer Mfg. Co.
Scientific Glass App.
Skaneateles Mfg.
Statham Labs.
Stoelting Co., C. H.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co.
U. S. Gauge
Universal X-Ray Prods.
Victory Engr.
Wallace & Tiernan
Weksler Thermometer
Weston Elec. Inst.

VACUUM RECORDERS

American Meter Co.
Ashton Valve Co.
Bailey Meter Co.
Bristol Co.
Consolidated Engg. Co.
Consolidated Vacuum
Defender Inst. & Reg.
Dickson Co.
Distillation Products
Engineering Res. & Dev.
Esterline Angus Co.
DeZurik Shower Co.
Fish-Schurman Corp.
Fischer & Porter
Foxboro Co.
Fredericks Co., George
GE Instrument Dept.
Gotham Inst.
Hastings Inst. Co.
Hays Corp.
Lear, Inc.
Manning, Maxwell, Moore
Marsh Corp.
Mason-Neilan Regulator
Minneapolis-Honeywell
Moore Products
National Research
Penn Ind. Inst. Div.
Precision Scientific
Republic Flow Meters
Schwien Engineering
Scientific Instrument Co.
Skaneateles Mfg.
Taylor Inst. Cos.
Trerice Co.
Uehling Instrument Co.
U. S. Gauge
Weksler Thermometer
Weston Elec. Inst.

VACUUM SPECTROGRAPHS (See Spectrographs, Vacuum)

VACUUM TUBES (See Tubes, Vacuum)

VACUUM TUBE BRIDGES (See Bridges Electrical, Vacuum Tube)

VACUUM TUBE RELAYS (See Relays, Vacuum Tube)

VACUUM TUBE VOLTMETERS (See Volt meters, Vacuum Tube)

VALVE BOX FINDER (See Finder, Valve Box)

VALVE-OPERATING DEVICES, Electric Motor

AiResearch Mfg.
Airmatic Valve
Allis-Chalmers
American Kloeckner
Automatic Temp. Control
Baldwin-Lima-Hamilton
Barber-Colman Co.
Barksdale Valves
Beck Co.
Bendix Aviation Corp.
Bristol Co.
Brooke Engineering
Cameron Iron Works
Clark Cooper Co.
Cleveland Fuel Equip.
Climax Div.
Continental Equip. Co.
Counter & Control Corp.
Cramer & Co., Inc.
Cutler-Hammer Inc.
DeZurik Shower
Dickson Co.
Eclipse-Pioneer Div.
Edward Valves
Foxboro Co.
General Controls Co.
General Electric Co.
General Regulator Corp.
Hays Corp.
Jenkins Bros.
Johnson Service Co.
Keckley Co., O. C.
Lear, Inc.
Leeds & Northrup
Lumenite Electronic
Magnetic Industries
Manning, Maxwell & Moore
Mc Alear Mfg. Co.
Minneapolis-Honeywell
Pacific Div.
Philadelphia Gear Works
Reliance Inst. Mfg. Co.
Republic Flow Meters
Robinette Co., W. C.
R-S Products
Sangamo Electric
Schwien Engr.
Shallcross Controls
Techniflex Corp.
Trans-Sonic Inc.
Vacuum Research Co.
Western Gear
Weston Elec. Inst.
Wilson & Co.

VALVE-OPERATING DEVICES, Electric Solenoid (See Valves, Solenoid)

VALVE OPERATING DEVICES, Hydraulic (See Valves, Hydraulically Operated)

VALVE OPERATING DEVICES, Pneumatic (See Valves, Diaphragm)

VALVE POSITION INDICATORS

Airmatic Valve
Allis-Chalmers
Annin Co.
Autocall Co.
Automatic Temp. Control
Bailey Meter Co.
Barber Coleman
Beck Co.
Bristol Co.
Builders-Providence
Climax Div.
Conoflow Corp.
Cutler-Hammer Inc.
Doelcam Div.
Elec. Indicator Corp.
Elec. Tachometer Corp.
Fischer & Porter
Fisher Governor
Foxboro Co.
General Controls
General Electric Co.
General Regulator Corp.
Hammel-Dahl Co.
Kieley & Mueller
Kybernetes Corp.
Lear, Inc.
Leupold & Stevens
Magnetic Industries
Mason-Neilan Regulator
Minneapolis-Honeywell
Moore Products
North American Insts.
Northern Equipment Co.
Pañellit, Inc.
Republic Flow Meters
SCAM Instrument
Taylor Inst. Cos.
Tejax Eng. Corp.
Uniflow Valve
Weighing Components
Westinghouse Elec. & Mfg.
Weston Elec. Inst.
Wheelco Instrument

VALVE POSITIONERS

AiResearch Mfg.
Annin Co.
Atlas Valve
Automatic Temp. Control
Bailey Meter Co.
Bristol Co.
Builders-Providence
Cash Co.
Cleveland Fuel Equip.
Conoflow Corp.
Cutler-Hammer Corp.
DeZurik Shower Co.
Farris Flexible Valve
Fisher Governor Co.
Foxboro Co.
General Controls
General Regulator
Hammel-Dahl
Hays Corp.
Johnson Service Co.
Ledeen Mfg. Co.
Magnetic Industries
Mason-Neilan Reg. Co.
Minneapolis-Honeywell
Moore Products Co.
Penn Ind. Inst. Corp.
Powers Regulator
Republic Flow Meters
Shallcross Controls
Swartwout Co.
Taylor Inst. Cos.
Techniflex Corp.
Weighing Components
Weston Elec. Inst.

VALVES AUTOMATIC SAFETY FUEL

Douglass Automatic
Fulton Sylphon Div.
Hagan Corp.
Security Valve Corp.
Warrick, Chas. F.

VALVES, Automatic Shut-off

Adel Precision Prods.
AiResearch Mfg.
Airmatic Valve
Annin Co.
A-P Controls
Askania Regulator Co.
Assoc. Valve & Engr. Co.
Atlas Valve Co.
Atwood & Morrill
Automatic Switch Co.
Automatic Temp. Control
Automatic Valve Control
Barber-Colman
Barksdale Valves
Bastian-Blessing
Black, Sivalls & Bryson
Cash Valve Mfg.
Clark Cooper Co.
Climax Div.
Continental Equip. Co.
Cutler-Hammer
Dahl Co., G.W.
Davis Reg. Co.
DeZurik Shower Co.
Eclipse Fuel Engr.
Edison, Instrument Div.
Edward Valves, Inc.
Exact Weight Scale
Farris Engineering
Farris Flexible
Fisher Governor
Fisher & Porter
Flexible Valve Corp.
Foster Engg. Co.
Frick Co.
Friez Instrument
Fulton Sylphon Div.
General Controls Co.
Gould Co., J.D.
Grove Regulator
Hammel-Dahl Co.
Haskó Valve & Machine
Hetherington & Berner, Inc.
Hills-McCanna
Imperial Brass Mfg.
Jackes-Evans Mfg.
James-Pond-Clark
Jerguson Gage Co. & Valve
Jordan Regulator Corp.
Kahn & Co.
Kieley & Mueller
Leslie Co.
Magnatrol Valve
Magnetic Industries
Mason-Neilan Regulator
McAlear Mfg.
McRae Corp.
Milwaukee Gas Spec.
Minneapolis-Honeywell
Natural Gas Equipment
North Amer. Mfg. Co.
OPW Corp.
Partlow Corp.
Paul Valve Co.
Pennsylvania Pump
Phillips Petroleum
Preferred Utilities
Research Controls
Reynolds Gas Regulator
Rockwell Co., W.S.
Ross Operating Valve
R-S Prod. Corp.
Schade Valve Mfg. Co.
Schrader's Son, A.
Security Valve Corp.
Seely Inst. Co., Inc.
Sinclair-Collins Valve
Skaneateles Mfg. Co.
Smith Co., S. Morgan
Smith Meter
Spence Engineering Co.
Sprague Eng'ng.
Straham Valves
Uniflow Valve
Vacuum Research Co.
Valco, Inc.
Valvair Corp.
Valv-Trol Co.
Vapor Recovery Systems
Weston Elec. Inst.
Zenith Optical

VALVES, Automatic Solenoid (See Valves, Solenoid)

VALVES, Balanced

Acme Scientific
Adel Precision Prods.
AiResearch Mfg.
Airmatic Valve
American Meter Co.
Annin Co.
Atlas Valve Co.
Atwood & Morrill
Automatic Switch
Automatic Temp. Control
Bailey Meter Co.
Baldwin-Lima-Hamilton
Barber Colman
Bendix Aviation Corp.
Black, Sivalls & Bryson
Boylston Co.
Bristol Co.
Cash Co.
Clark Cooper Co.
Climax Div.
Conoflow Corp.
Continental Foundry
Dahl Co., G. W.
Davis Reg. Co.
Dennison Engineering
Farris Engineering
Farris Pickering Governor
Fischer & Porter
Fisher Governor Co.
Ford Reg. Valve Co.
Foster Engg. Co.
Foxboro Co.
General Controls Co.
Hammel-Dahl Co.
Hasko Valve & Machine
Industrial Engineering
James-Pond-Clark
Jenkins Bros.
Johnson Service Co.
Jordan Regulator Corp.
Keckley Co., O. C.
Kieley & Mueller
Klipfel Valves
Leslie Co.
Mason-Neilan Regulator
McAlear Mfg.
Minneapolis-Honeywell
Natural Gas Equipment
Newmatic Corp.
North Amer. Mfg. Co.
OPW Corp.
Powers Regulator Co.
Republic Flow Meters
Republic Mfg.
Research Controls
Reynolds Gas Regulator
Ross Operating Valve
Schade Valve Mfg. Co.
Seely Inst. Co., Inc.
Sinclair Collins Valve
Spence Engineering Co.
Swartwout Co.
Trerice Co.
Valv-Trol Co.
Valvair Corp.
Vickers, Inc.
Watts Regulator Co.
Weston Elec. Inst.
Wood, Harry W.

VALVES, Butterfly

Baldwin-Lima-Hamilton
Black, Sivalls & Bryson, Inc.
Conoflow Corp.
Dahl Co.
Fisher Governor Co.
Foxboro Co.
Hammel-Dahl Co.
Hasco Valve & Machine
Johnson Service Co.
McKenna Labs.
Minneapolis-Honeywell
Republic Flow Meters
Worthington Corp.

VALVES, Constant Pressure

Air Associates
AiResearch Mfg.
Airmatic Valve
Alco Valve
Assoc. Valve & Engrg.
Atlas Valve
Atwood & Morrill
Automatic Switch
Bailey Meter Co.
Bastian-Blessing Co.
Black, Sivalls & Bryson
Brooke Engineering
Cash Co.
Cash Valve Mfg. Corp.
Clark Cooper Co.
Climax Div.
Conoflow Corp.
Continental Equip. Co.
Cutler Hammer

Davis Reg. Co.
Dennison Engineering
Eclipse Fuel Engr.
Fisher Governor Co.
Foster Engg. Co.
General Controls
General Regulators
Grove Valve & Regulator
Hammel-Dahl Co.
Henry Valve Co.
Hoke, Inc.
Industrial Engineering
Jenkins Bros.
Jordan Regulator
Kates Co., W. A.
Keckley Co., O. C.
Kieley & Mueller
Klipfel Valves
Leslie Co.
Mason-Neilan Regulator
McAlear Mfg.
Mercon Regulator
Minneapolis-Honeywell
Moog Valve
Newmatic Corp.
Powers Regulator Co.
Reynolds Gas Regulator
Rockwell Co., W. S.
R-S Prod. Corp.
Schade Valve Mfg. Co.
Seely Inst. Co.
Sinclair-Collins Valve
Spence Engineering Co.
Stratos Div.
Superdraulic Corp.
Swartwout Co.
Taylor Inst. Co.
Uniflow Valve
Vickers, Inc.
Watts Regulator Co.
Weston Elec. Inst.

VALVES, Diaphragm

Adel Precision Products
Air Associates
AiResearch Mfg.
Airmatic Valve
American Meter Co.
Annin Co.
Askania Regulator Co.
Assoc. Valve & Engrg.
Atlas Valve Co.
Atwood & Morrill
Automatic Switch Co.
Automatic Temp. Control
Bailey Meter Co.
Baldwin-Lima-Hamilton
Bastian-Blessing Co.
Bendix Aviation Corp.
Black, Sivalls & Bryson
Boylston Co.
Bristol Co.
Cash Co.
Cash Valve Mfg.
Century Instrument Co.
Climax Div.
Conoflow Corp.
Continental Equip. Co.
Cook Electric
Cutler-Hammer
Dahl Co., G. W.
Davis Reg. Co.
DeZurik Shower Co.
Eclipse Fuel Engr.
Eclipse-Pioneer Div.
Edward Valves, Inc.
Emmett Machine
Farris Engineering
Farris Flexible Valve
Fischer & Porter
Fisher Governor
Flexible Valve Corp.
Foster Engg. Co.
Foxboro Co.
Fulton Sulphon Div.
General Controls Co.
Gotham Inst. Div.
Grinnell Co., Inc.
Hagan Corp.
Hammel-Dahl Co.
Hasko Valve & Machine
Henry Valve Co.
Hills-McCanna
Hoke, Inc.
Hunt & Son
Imperial Brass Mfg.
Industrial Filter
Jackes-Evans
Johnson Service Co.
Jordan Regulator
Keckley Co., O. C.
Kieley & Mueller
Klipfel Valves
Kohler Co.
Laboratory Equipment
Ledeen Mfg.
Leslie Co.
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg.
Mead Specialties Co.
Milwaukee Gas
Minneapolis-Honeywell
National Pneumatic
Natural Gas Equipment
North Amer. Mfg. Co.
Partlow Corp.
Paul Valve Co.
Perfex Corp.
Powers Regulator Co.
Pressure Products
Refrigerating Spec. Co.
Republic Flow Meters
Research Controls
Reynolds Gas-Regulator
R.K.L. Valve
Rockwell Co., W. S.
Rockwell Mfg.
Rockwood Sprinkler
R-S Products Corp.
Schade Valve Mfg. Co.
Schutte & Koerting
Scientific Instrument Co.
Security Valve Corp.
Seely Inst. Co., Inc.
Sinclair Collins Valve
Smith Co., S. Morgan
Spence Engineering Co.
Stratos Div.
Swartwout Co.
Taylor Inst. Cos.
Trerice Co.
Uniflow Valve
Valv-Trol Co.
Valvair Corp.
Watts Regulator
Weston Elec. Inst.
White-Rodgers Electric

VALVES, Electrically Operated

Adel Div. Gen. Metals
AiResearch Mfg.
Airmatic Valve
Alco Valve Co.
American Valve Co.
Annin Co.
A-P Controls Corp.
Assoc. Valve & Engrg.
Atkomatic Valve Co.
Atlas Valve Co.
Atwood & Morrill
Autoclave Eng'rs.
Automatic Switch
Automatic Temp. Control
Baldwin-Lima-Hamilton
Barber-Colman
Barksdale Valve
Beck Co.
Bendix Aviation Corp.
Black, Sivalls & Bryson
Bridgeport Thermostat Div.
Bristol Co.
Brooke Engineering
Builders-Providence
Carruthers & Fernandez
Cash Co., A.W.
Clark Controller Co.
Clark Cooper Co.
Continental Equip. Co.
Cutler-Hammer, Inc.
Dahl Co., G.W.
Davis Reg. Co.
Denison Engineering
DeZurik Shower Co.
Distillation Products
Eclipse Fuel Engr.
Edward Valves, Inc.
Electric Valve Mfg.
Fischer & Porter
Flexible Valve Corp.
Foster Engg. Co.
Foxboro Co.
Frick Co.
Friez Instrument
General Controls Co.
General Electric Co.
General Regulator
Gould Co., J.D.
Grinnell Co., Inc.
Guardian Elec. Mfg.
Hasko Valve & Machine
Henry Valve Co.
Hills-McCanna
Hunt & Son
Hydraulic Controls, Inc.
Jenkins Bros.
Johnson Service
Keckley Co., O.C.
Kieley & Mueller
Lear, Inc.
Ledeen Mfg. Co.
Leslie Co.
Lumenite Electronic
Magnatrol Valve Corp.
Magnetic Industries
Manning, Maxwell & Moore
Marsh Corp., Jas. P.
Mason-Neilan Regulator
Mc Rae Corp.
Midwestern Instruments
Minneapolis-Honeywell
Moog Valve
Northern Equipment Co.
Paul Valve Co.
Penn Electric Switch
Perfex Corp.
Philadelphia Gear Works
Preferred Utilities
Revere Corp.
R.K.L. Valve
Rockwell Co., W.S.
Rockwell Mfg. Co.
Ross Operating Valve
R-S Prod. Corp.
Sarco Co., Inc.
Schade Valve Mfg. Co.
Schrader's Son, A.
Schutte & Koerting
Sinclair-Collins Valve
Smith Co., S. Morgan
Spence Engineering Co.
Square D. Co.
Standard Controls, Inc.
Supreme Elec. Prods.
Topp Industries, Inc.
Vacuum Elec. Engr.
Vacuum Research Co.
Valvair Corp.
Versa Products
Vickers, Inc.
Waterman Eng'ng.
Wedgeplug Valve
Weighing Components
Weston Elec. Inst.
White-Rodgers Elec. Co.
W-K-M Mfg. Co.
Yellow Springs Inst. Co.

VALVES, High Pressure

Adel Precision Prod.
Air Associates
Annin Co.
Atlas Valve
Autoclave Engrs., Inc.
Automatic Switch
Bailey Meter Co.
Barksdale Valves
Black, Sivalls & Bryson, Inc.
Bridgeport Thermo. Div.
Carruthers & Fernandez
Cash Valve Mfg. Co.
Conoflow Corp.
Crosby Steam Gage
Dahl Co.
Dragon Engr. Co.
Edward Valves
Farris Eng'ng. Corp.
Fisher Governor Co.
Foxboro Co.
Gould Co., J. D.
Hammel-Dahl Co.
Hasco Valve & Machine
Hunt & Son
Industrial Engr. Corp.
Inst. Dev. & Mfg. Corp.
James-Pond-Clark
Jerguson Gage & Valve
Johnson Service Co.
Kahn & Co.
Leslie Co.
McRae Corp.
Minneapolis-Honeywell
Pressure Products Industries
Republic Flow Meters
Republic Mfg. Co.
Research Controls
Schutte & Koerting
Seely Inst. Co.
Squires Co.
Vickers, Inc.
Wedgeplug Valve Co.
W-K-M Mfg. Co.

VALVES, Hydraulically Operated

Acme Industrial
Adel Div., Gem. Metals
Aero-Coupling Corp.
Aeroquip Corp.
Air Associates
AiResearch Mfg.
Airmatic Valve
American Instrument
Annin Co.
Area Regulators Inc.
Askania Regulator
Assoc. Valve & Engrg.
Atlas Valve Co.
Atwood & Morrill
Autoclave Eng'rs.
Automatic Switch
Auto. Temp. Control
Bailey Meter
Baldwin-Lima-Hamilton
Barber Colman Co.
Barksdale Valves
Bendix Aviation Corp.
Black, Sivalls & Bryson
Bridgeport Thermostat Div.
Bristol Co.
Builders-Providence
Cameron Iron Works
Carruthers & Fernandez
Cash Co.
Clark Cooper Co.
Conoflow Corp.
Continental Equip Co.
Controls, Inc.
Denison Engineering
DeZurik Shower Co.
Douglass Automatic
Eclipse Fuel Engr.
Eclipse-Pioneer Div.
Farris Engineering
Farris Pickering Governor
Farris Valve Corp.
Fisher Governor
Flexible Valve Corp.
Ford Instrument
Foster Engg. Co.
Fulton Sylphon Div.
General Controls
General Electric Co.
General Regulator Corp.
Grinnell Co., Inc.
Guardian Elec. Mfg.
Hagan Corp.
Hammel-Dahl Co.
Hasko Valve & Machine
Hays Corp.
Hills-McCanna
Hunt & Son
Hydraulic Controls, Inc.
Jenkins Bros.
Johnson Service Co.
Keckley Co., O.C.
Kieley & Mueller
Kohler Co.
Lear, Inc.
Ledeen Mfg.
Leslie Co.
Leupold & Stevens
Manning, Maxwell & Moore
Mason-Neilan Regulator
McAlear Mfg. Div.
McRae Corp.
Midwestern Instruments
Minneapolis-Honeywell
Natural Gas Equipment
Paul Valve Co.
Perfex Div.
Philadelphia Gear Works
Phen-Trol Devices
Powers Regulator Co.
Pressure Products
Republic Flow Meter
Republic Mfg. Co.
R.K.L. Valve
Rockwell Co., W.S.
Rockwell Mfg.
R-S Prod. Corp.
Schade Valve Mfg. Co.
Schutte & Koerting
Seely Inst. Co.
Shallcross Controls
Shand & Jurs Co.
Sinclair-Collins Valve
Smith Co., S. Morgan
Spence Engineering
Standard Controls, Inc.
Sterling Eng. Co.
Sundstrand Machine Tool
Superdraulic Corp.
Topp Industries, Inc.
Vacuum Research Co.
Valvair Corp.
Vectron, Inc.
Versa Products
Vickers, Inc.
Waterman, Eng. Co.
Weighing Components

VALVES, Lubricated Plug

ACF Industries, Inc.
Acme Industrial
Airmatic Valve

Simplicity and Good Design Features in

POWERS

FLOWRITE VALVES

STURDY, PRACTICAL DESIGN Strong, light weight precision cast alloy housing is corrosion resistant. Only 6 bolts saves maintenance time.

POWERS
FLOWRITE VALVE
TYPE
TO COMPRESS SPG
TURN

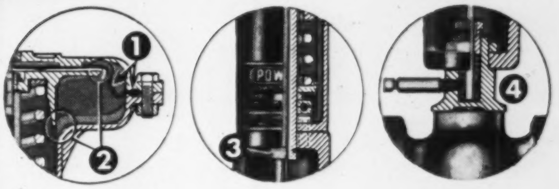
POWERS CONTROL

OVER 60 YEARS of Temperature and Humidity Control.

Ball Check Lubricator with Silicone grease for temperatures 40° to 500° F.

(b98)

For Pressures up to 250 PSI.



give close control and they last longer

❶ **Diaphragm** has a formed bead which provides increased sealing action with increasing control pressure. It has no bolt holes. Diaphragm lasts longer.

❷ **Piston plate assembly** has a free floating thrust plate which absorbs side thrust. Closely guided piston plate maintains valve stem in accurate alignment. High tensile strength steel spring is cadmium plated and completely enclosed.

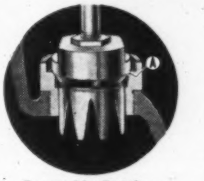
❸ **Adjustment screw** is non-rising ball bearing type cadmium plated, easily accessible, easy to adjust.

❹ **Packing:** Deep packing space contains preformed lubricated packing readily accessible. Note lubricator.

Accurate control results from smooth rolling diaphragm and minimum of valve stem friction.

Right type and size of valve is important for good control. An experienced Powers engineer will gladly help you make the right selection. Call our nearest office or write us direct.

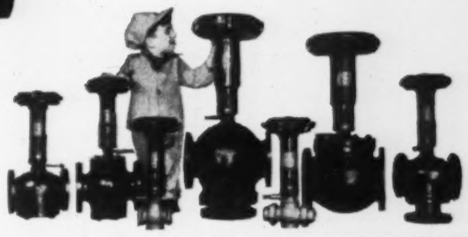
AT NO EXTRA COST
POWERS CONTROL SYSTEMS
Include these Premium Quality Valves
Get complete information, write for series 344 bulletins



Renewable Stainless Steel, Disc and Seat.

Compare POWERS Single Seat Valves with other high quality valves. Check their performance, tight shut off feature and sturdy construction.

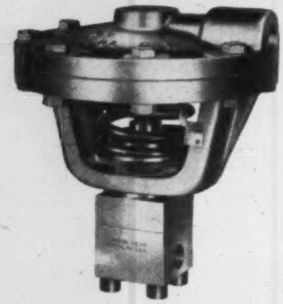
Available: Composition Disc also V-Port characterized which gives straight line control. Separate shut off seat (A) reduces wire drawing, insures tight shut off.


SINGLE SEAT • DOUBLE SEAT • 3-WAY MIXING VALVES

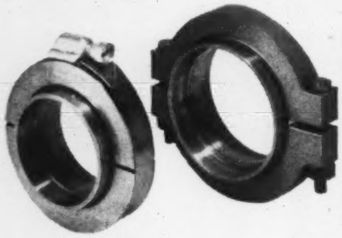
Established 1891 **THE POWERS REGULATOR COMPANY** Skokie, Illinois
Offices in Chief Cities in U.S.A., Canada and Mexico, See Your Phone Book
For more information circle **376** on inquiry card.

MINIATURIZATION

From Pilot Plant to Process

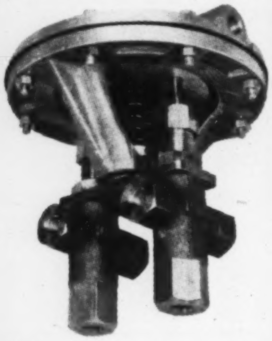


◆ **"BANTAM" 500 SERIES**
Throttling "Bantam" Diaphragm Control Valves for all standard control valve uses, Cv of 0.6 and below, up to 1000 psi and 500°F, characterized, renewable trim, 316 stainless steel and teflon only wetted surfaces, low in hysteresis, size and weight, a modern design of control valve. 2000 series "Bantam" Control Valves available for on-off service.

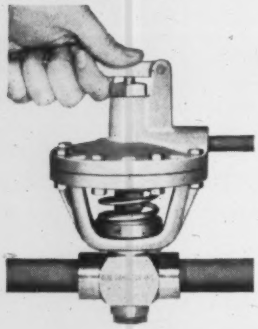


TUBE AND PIPE CONNECTORS ◆
For use in such systems as aircraft or marine applications where weight is a factor, these connectors replace standard flanges. Available in various materials, in male or female socket or butt weld design, for tubing, and up to schedule 40 pipe.

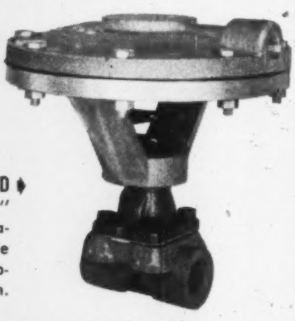
◆ **"DEMI" PACKLESS VALVES**
For services when packing is a problem, manifolding of small valves in one unit, these low cost valves have a great popularity. For services up to 1500 psi and 500°F., screw, toggle, or diaphragm operated, the "Demi" line is ideal for panel mounting up to five valves in one block.



WHIFFLETREE OPERATOR ◆
Two valves operated simultaneously by one operator. Valves may be globe or three-way and have a multitude of piping arrangements for mixing and routing applications.



◆ **MANUAL RESET**
Wherever control air on dangerous or toxic process flows must be blocked for safety, on air failure until manually reset, these valves insure against disaster. Standard sizes ¼" and ½" I.P.S.



SAUNDERS VALVES — AIR OPERATED ◆
Plastic valves, 2" and below, metal valves 1" and below, G. W. Dahl Company, Inc. diaphragm operators on these valves provide simple, sure automatic operation. Each application must submit full flow information.

Write us for complete technical information, or the address of our representative in your area.

George W. DAHL Company
BRISTOL, RHODE ISLAND

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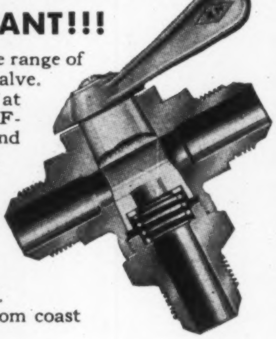
REPUBLIC

VALVES

INDUSTRIAL • CHEMICAL • AIRCRAFT

What! PLUG VALVES THAT TURN EASILY AT 65° BELOW!! WITH NO LUBRICANT!!!



Up to 250°, down to −65° F, is the range of Republic's LO-TEMP selector valve. Easy turning, positive sealing, at pressures to 100 psi. Tapered TEFLON plug requires no lubricant, and is not affected by acids or alkalis.

Aluminum body for aircraft and general use, stainless steel for chemical, food, and dairy industries. Angle, 2, 3, 4-way, with or without drain, flanged for panel mounting.

Write for Bulletin No. 754.
Distributors in principal cities from coast to coast.

CHECK

RELIEF

PLUG

GLOBE

NEEDLE

134

RM **REPUBLIC MANUFACTURING CO.**
15655 BROOKPARK ROAD • CLEVELAND 11, OHIO

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Clark Cooper Co.
Eclipse Fuel Engr.
General Controls
Imperial Brass Mfg.
Industrial Filter
Kohler Co.
Leslie Co.
Parker Appliance
Republic Mfg. Co.
Rockwell Mfg.
W-K-M Mfg. Co.

VALVES, Motor Operated (See Valves, Diaphragm; Electrically-operated; Hydraulically-operated; and Solenoid)

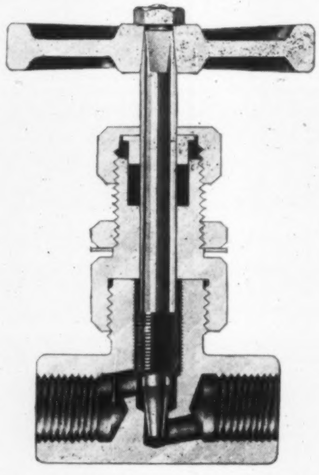
VALVES, Needle
Annin Co.
Automatic Switch
Bailey Meter Co.
Baldwin-Lima-Hamilton
Dahl Co.
Dragon Engr. Co.
Edward Valves
Fisher Governor Co.
Foxboro Co.
Henry Valve Co.
Imperial Brass Mfg. Co.
James-Pond-Clark
Jerguson Gage & Valve
Marsh Corp.
Pressure Products Industries
Republic Mfg. Co.
Research Controls
Robbins & Associates
Vickers, Inc.

VALVES, Non-Lubricated Plug
Conant Bros. Co.
Dahl Co.
Hasco Valve & Machine
Minneapolis-Honeywell
Republic Mfg. Co.
Wedgeplug Valve Co.

VALVES, Packless Air-operated
Powers Regulator Co.

VALVES, Pressure Relief, Reducing, etc.
Acme Industrial
Adel Div., Gen. Metals
Aeromarine Inst. Co.
Air Associates
AiResearch Mfg.
Airmatic Valve
American Meter Co.
A-P Controls Corp.
Ashton Valve Co.
Askania Regulator Co.
Assoc. Valve & Engrg.
Atlas Valve Co.
Atwood & Morrill
Autoclave Engineers

DRAGON NEEDLE VALVES



Designed for HIGH PRESSURE service where POSITIVE fluid control, SAFETY and economy are vitally important. DRAGON forged steel, Monel and stainless steel needle VALVES are available in globe or angle type and for panel mounting installations.

DRAGON ENGINEERING CO.
5815 So. Central Ave.
Los Angeles 11, Calif.

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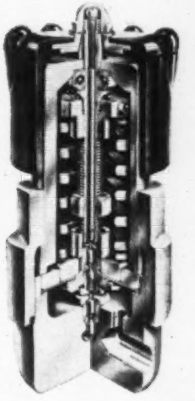
GROVE SMALL VOLUME HIGH PRESSURE REGULATORS



For accurate control of air, gas, liquid

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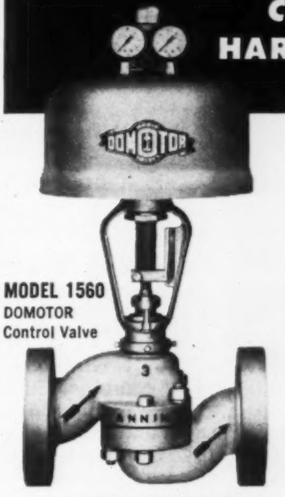

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DOMOTOR
Control Valve

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Handwheel Valve, Figure 15

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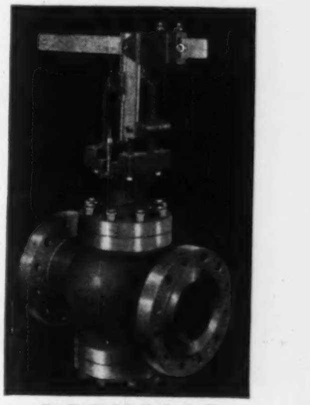

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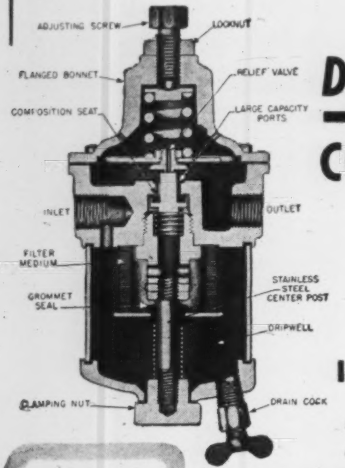

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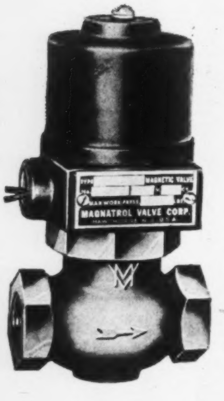

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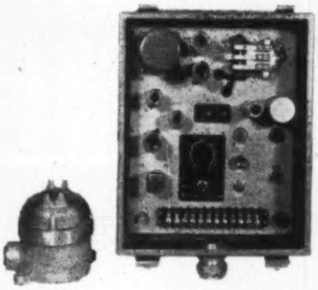

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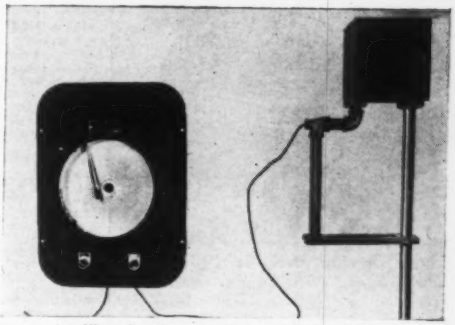

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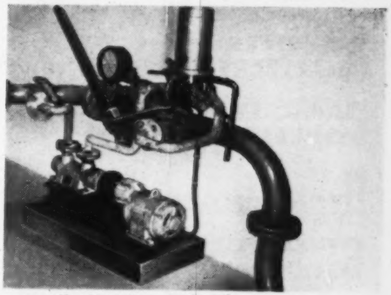

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VISCOSIMETERS, Plastic Flow Fluids

Bendix Aviation Corp.
Doelcam Div.
Electro-Physics Co.
General Electric
Norcross Corp.
Scientific Inst. Co.
Southwestern Ind. Elec.
Testing Machines, Inc.

VISCOSIMETERS, Recording

Brabender Corp.
Bristol Co.
Brookfield Engg. Labs.
Cincinnati Div.
Coleman Inst. & Mfg.
Doelcam Div.
Drage Products
Electro-Physics Co.
Fischer & Porter
Hagan Corp.
Hallikainen Instruments
Hayes Scientific App.
Instrument Dev. Labs.
Norcross Corp.
Precision Scientific

VISCOSIMETERS, Redwood

American Inst. Co.
Hiergesell & Sons
Labline, Inc.
Ruehfel Co.

VISCOSIMETERS, Saybolt

American Inst. Co.
Boekel & Co.
Bristol Co.
Central Scientific Co.
Corning Glass Works
Eitzen Co.
Fisher Scientific
Freas Glass Works
Hiergesell & Sons
Humboldt Mfg. Co.
Kimble Glass Co.
Koehler Instruments
Labline, Inc.
Monarch Mfg. Wks.
Owens Illinois Glass
Precision Scientific Co.
Ruehfel Co.
Sargent & Co., E. H.
Scientific Glass App.
Zuhr, Inc., Henry

VISCOSIMETERS, Scott

Boekel & Co.
Central Scientific Co.
Hiergesell & Sons
Precision Scientific Co.
Ruehfel Co.
Sargent & Co.
Scott Testers

VISCOSIMETERS, Stormer

Aloe Co., A. S.
Central Scientific Co.
Hiergesell & Sons
Industro-Scientific Co.
Sargent & Co., E. H.
Thomas Co., Arthur H.

VISCOSIMETERS, Ubberohde

Ace Glass, Inc.
American Inst. Co.
Boekel & Co.
Cannon Instrument Co.
Central Scientific Co.
Fish-Schurman Co.
Fisher Scientific
Hiergesell & Sons
Kontes Glass Co.
Labline, Inc.
Precision Scientific Co.
Sargent & Co., E. H.
Scientific Development
Scientific Glass App.
Testing Machines, Inc.

VISCOSIMETERS, Ultrasonic

Gulton Mfg. Corp.
Ultrasonic Engrg. Co.

VISCOSIMETERS, Zahn

Central Scientific
GE Apparatus Sales
GE Instrument Dept.
La Pine & Co., A. S.
Precision Scientific
Sargent & Co., E. H.

VISCOSITY GAGES

Ace Glass, Inc.
Berkeley Scientific Div.
Eitzen Co., L. C.
GE Instrument Dept.
Gerin Corp.

VISCOSITY REGULATORS (See Controllers, Automatic, Viscosity)

VISCOSITY TUBES

Ace Glass, Inc.
Bellco Glass Co.
Berkeley Scientific Div.
Cargille, R. P.
Coleman Inst. Co.
Eitzen Co.
Fischer & Porter
Fish-Schurman Co.
Gardner Laboratory
Humboldt Mfg. Co.
Koehler Instrument
Owens Illinois Glass
Phoenix Prec. Inst.
Precision Scientific
Scientific Development
Scientific Glass App.

VOLTAGE ADJUSTERS, Automatic

Acme Electric
Amplifier Co.
Assembly Products
Cal-Tronics Corp.
GE Apparatus Sales
General Radio
Lewis Co., J. B.
Precise Measurements
Raytheon Mfg. Co.
Rockwell Engr.
Sherron Metallic
Sola Electric Co.
Sorensen & Co.
Teletronics Lab.
Thordarson-Meissner

VOLTAGE DETECTORS (See Detectors, Voltage)

VOLTAGE DIVIDERS, Radio Frequency (See Dividers, Voltage)

VOLTAGE, HIGH (above 2300 volts) INDICATORS

Associated Research
Atomic Instrument
Ballantine Labs.
Bradshaw Instruments
Columbus Products Corp.
Dale Instruments
Dittmore & Freimuth
Feiler Engineering
General Elec. Co.
General Electronic
General Physical Lab.
Keithley Instruments
Leeds & Northrup Co.
Meters, Inc.
Peschel Electronics
Phaostron Co.
Precise Measurements
Precision Apparatus
Rawson Electrical Inst.
Roller-Smith
Sensitive Research Inst.
Shallcross Mfg.
Sherron Metallic
Sylvania Elec. Prod.
Triplett Electrical Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

VOLTAGE, HIGH (above 2300 volts) Measuring Devices

Advance Electronics
Associated Research
Ballantine Labs.
Barber Labs., Alfred
Bradshaw Instruments
Cal-Tronics Corp.
Columbus Products Corp.
Dittmore & Freimuth
Electronic Instrument
Federal Telephone
Feiler Engineering
Ferranti Electric
Freed Transformer
Fox Valley Inst.
General Elec. Co.
General Electronic
Hickok Elec. Inst. Co.
International Resistance
Keithley Instruments
Leeds & Northrup
Meters, Inc.
Peschel Electronics
Phaostron Co.
Precise Development
Precise Measurements
Precision Apparatus
Radio City Products
Rawson Elec. Inst. Co.
Reiner Electronics
Roller-Smith
Sensitive Research Inst.
Shallcross Mfg.
Sherron Metallic
Simpson Electric Co.
Spellman TV Corp.
Sylvania Elec. Prod.
Triplett Elec. Inst.
Westinghouse Elec.
Westinghouse X-Ray Co.
Weston Elec. Inst. Corp.

VOLTAGE, HIGH (above 2300 volts) Testing Devices

American Transformer
Associated Research
Bradshaw Instruments
Cal-Tronics Corp.
Del Electronics
Dittmore & Freimuth
Electronic Instrument
El Mec Laboratories
Feiler Engineering
General Elec. Co.
General Electronic
Industrial Insts., Inc.
Industrial Test Equip.
International Resistance
Keithley Instruments
MacLeod & Hanopol
Manson Labs.
Miller Co., Bertrand F.
Phaostron Co.
Precise Measurements
Precision Apparatus
Peschel Electronics
Radio City Products
Raytheon Mfg. Co.
Reiner Electronics
Roller-Smith Co.
Sensitive Research Inst.
Shallcross Mfg. Co.
Sherron Metallic
Simpson Electric
Spellman TV Corp.
States Co.
Superior Elec. Co.
Thordarson-Meissner
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst. Corp.

VOLTAGE REGULATORS (See Regulators, Automatic, Voltage)

VOLTAGE SUPPLIES (See Power Supplies)

VOLT-AMMETERS

Am. Elec. Sales Co.
Assembly Products
Associated Research, Inc.
Beckman Instruments
Bradshaw Instruments
Bristol Co.
Burlington Inst. Co.
Chicago Industrial
Clough-Brengle Co.
Columbia Electric Mfg.
Columbus Products Corp.
Computer Co. of America
Dale Instruments
De Jur Amsco Corp.
Dittmore & Freimuth
Electro-Mechanical Insts.
Electro-Tech Equip. Co.
Electronic Dev. Lab.
Electronic Instrument
Engelhard, Inc., Charles
Esterline-Angus Co.
Feiler Engineering
Fox Valley Inst.
GE Apparatus Sales
General Electronic
Greibach Instruments
Hickok Elec. Inst. Co.
International Instrument
Lewis Engineering
Marion Elec. Inst.
Martindale Elec. Co.
Meters, Inc.
Mil Instrument Corp.
Miller, M. C.
Phaostron Co.
Physics Research
Precision Apparatus Co.
Pyramid Inst. Co.
Radio City Products
RCA Div.
Rawson Electrical Inst.
Reiner Electronics
Roller-Smith Co.
Sangamo Electric
Schauer Mfg. Co.
Sendur Mfg.
Sensitive Research Inst.
Shurite Meters
Simpson Electric
Sticht Co.
Sun Electric
Supreme Instruments
Triplett Electrical Inst.
United Electric Co.
United Optical Mfg.
U. S. Gauge
Welch Scientific
Westberg Mfg. Co.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Instrument

VOLT-AMPERE-HOUR METERS

Ferranti Electric, Inc.
General Electric Co.
Minneapolis-Honeywell
Roller-Smith
Sangamo Electric
Simpson Electric
Westinghouse Elec.

VOLT-AMPERE METERS, Reactive

Bristol Co.
Electrical Facilities, Inc.
Esterline-Angus Co.
GE Apparatus Sales
GE Instrument Dept.
General Electronic
Hickok Elec. Instrument
Landis & Gyr, Inc.
Roller-Smith
Sangamo Electric
Sensitive Research Inst.
Simpson Electric
Triplett Elec. Inst.
Westinghouse Elec.
Weston Elec. Inst.

VOLTMETERS, A-c. Rectifier

Assembly Products
Associated Research
Ballantine Labs.
Bradshaw Instruments
Bristol Co.
Burlington Instrument
Chicago Industrial
Columbus Products Corp.
Dale Instruments
De Jur-Amsco Corp.
Dittmore & Freimuth
Electric Des. & Mfg.
Electronic Eng'ng. Service
Electronic Instrument
Esterline-Angus Co.
Feiler Engineering
Gar Electrical Instrument
General Electric Co.
General Electronic
General Radio Co.
Hewlett-Packard
Hickok Elec. Inst.
International Instruments
Mag Electric
Marion Electrical Inst.
Meters, Inc.
Mil Instrument Corp.
Norton-Elec. Inst. Co.
Pace Electrical Inst.
Phaostron Co.
Physics Research
Precision Apparatus
RCA Div.
Roller-Smith
Sendur Mfg.
Sensitive Research Inst.
Shallcross Mfg.
Shasta Div.
Simpson Electric
Sterling Mfg. Co.
Supreme, Inc.
Sylvania Elec. Prod.
Triplett Elec. Inst.
United Optical Mfg.
U. S. Gauge Co.
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst. Corp.

VOLTMETERS, Contact Making

Assembly Products
Bristol Co.
De Jur-Amsco
Edison Electrical Controls
Electric Des. & Mfg.
Electric Laboratory
Electric Tachometer Corp.
Electronic Development
Engineering Labs., Inc.
Esterline-Angus Co.
Ferranti Electric, Inc.
General Electric Co.
General Electronic
Georator Corp.
Hickok Electrical Inst.
Larson Instrument
Lewis Engineering
Marion Elec. Inst.
Roller-Smith Co.
Triplett Elec. Inst.
United Electric Co.
Weston Electrical Inst.
Wheelco Instrument

VOLTMETERS, Digital

Computer Corp. of Am.
Datran Engg.
Hanson-Gorrill-Brian
Hycon Mfg. Co.
Leeds & Northrup Co.
Link Aviation
Moseley Co.
Non-Linear Systems, Inc.
Phaostron Co.
Weston Elec. Inst.

VOLTMETERS, Electrostatic

Assembly Products
Cambridge Inst. Co.
Dittmore & Freimuth
Ferranti Electric, Inc.
General Elec. Co.
General Electronic
Hathaway Inst. Co.
Hickok Elect. Inst. Co.
Keithley Instruments
Landsverk Electrometer
Minnesota Electronics
Rawson Electrical Inst.
Scientific Specialties
Sensitive Research Inst.
Sticht Co.
United Optical Mfg.

VOLTMETERS, Indicating

Arga Division
Assembly Products
Associated Research
Ballantine Labs.
Barber Colman
Beede Elec. Instrument
Burlington Inst. Co.
Cal-Tronics Corp.
Chicago Indust. Inst.
Clough-Brengle Co.
Columbia Elec. Mfg.
Columbus Products Corp.
Control Corp.
Dale Instruments
De Jur-Amsco Corp.
Dittmore & Freimuth

Doelcam Div.
Electric Des. & Mfg.
Electro-Mechanical Inst.
Electronic Development
Electronic Meas. Co.
Feiler Engineering
Ferranti Electric, Inc.
Fielden Instrument
GE Apparatus Sales
GE Instrument Dept.
General Electronic
Hickok Elec. Inst. Co.
Industrial Control Co.
International Instruments
J-B-T Insts.
Kay Electric
Keithley Instruments
Lewis Engineering
Link Aviation
Mag Electric
Marion Electrical Inst.
Meters, Inc.
Mil Instrument Corp.
Miller, M. C.
Minnesota Electronics
Niagara Electrical Inst.
Norton Elec. Inst. Co.
Pace Electrical Inst.
Phaostron Co.
Physics Research
Precision Apparatus Corp.
Radio City Products Co.
Rawson Electrical Inst.
RCA Tube
Reiner Instrument
Roller-Smith Co.
Scott Inc., Hermon
Sendur Mfg.
Sensitive Research Inst.
Shasta Div.
Shelby Inst.
Shurite Meters
Sierra Electronic
Simpson Electric
Southwestern Ind. Elec.
Sterling Mfg. Co.
Sticht Co.
Sun Electric Corp.
Supreme, Inc.
Triplett Elec. Inst.
Triumph Mfg. Co.
United Electric Co.
United Optical Mfg.
U. S. Gauge
Welch Scientific
Westinghouse Elec.
West Corp.
Weston Elec. Inst. Corp.
Wheelco Div.
Winslow Co.

VOLTMETERS, Laboratory Standard

Advance Electronics
Ballantine Labs.
Beckman Instruments
Burlington Instrument
Central Scientific
Columbus Products Corp.
Computer Co. of America
Dittmore & Freimuth
Doelcam Div.
Electronic Instrument
Engelhard Inc., Charles
Feiler Engineering
Ferranti Electric
General Electric Co.
General Electronic
Greibach Instruments
Hickok Elec. Inst. Co.
Industrial Control Co.
Measurements Corp.
Non-Linear Systems
Physics Research
Rawson Elec. Inst.
Roller-Smith Co.
Sensitive Research Inst.
Simpson Electric
Southwestern Ind. Elec.
Triplett Elec. Inst.
United Optical Mfg.
U. S. Gauge Co.
Waveform, Inc.
Welch Scientific
Weston Elec. Inst. Corp.

VOLTMETERS, Megohm

Assembly Products
Associated Research
Beckman Instruments
Beede Elec. Instrument
Beta Electric Corp.
Co-Design Corp.
Columbus Products Corp.
Dale Instruments
Daven Co.
Delmhorst Instrument
Electro Products Lab.
Electro-Tech. Equip. Co.
Electronic Dev. Lab.
Feiler Engineering
Freed Transformer
General Electronic
General Radio Co.
Greibach Instruments
Hickok Elec. Inst. Co.
Industrial Control Co.
Industrial Insts. Inc.
Jackson Electrical Inst.
Keithley Instruments
Martindale Elec. Co.
Millivac Inst.
Non-Linear Systems
Phaostron Co.
Physics Research
Precise Measurements
Precision Apparatus
Radio City Products
Rawson Electrical Inst.
RCA Tube
Sensitive Research Inst.
Shallcross Mfg. Co.
Simpson Electric
Southwestern Ind. Elec.
Sticht Co.
Sun Manufacturing
Triplett Elec. Inst.
United Optical Mfg.
Welch Scientific
Westinghouse Elec.
Western Elec. Inst. Corp.
Western Radiation Labs.

VOLTMETERS, Micro

Associated Research
Ballantine Labs.
Bristol Co.
Cambridge Inst. Co.
Columbus Products Corp.
Computer Co. of America
Dale Instruments
De Jur-Amsco Corp.
Dittmore & Freimuth
Doelcam Div.
Federal Telephone & Radio
General Electric Co.
General Electronic
General Radio Co.
Greibach Instruments
Hickok Elec. Inst. Co.
Industrial Control Co.
Kay-Lab.
Keithley Instruments
Liston-Becker Inst. Co.
Microvolts, Inc.
Millivac Inst.
Phaostron Co.
Rawson Electrical Inst.
Sensitive Research Inst.
Simpson Electric
Supreme Inc.
Televiso Co.
Triplett Elec. Inst.
Welch Scientific
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

VOLTMETERS, Micro, Radio Frequency

Ballantine Labs.
Burlington Inst. Co.
Clarke Inst. Corp.
Columbus Products Corp.
Computer Co. of America
Electric Des. & Mfg.
Empire Devices
Federal Telephone
Feiler Engineering
Ferris Inst. Corp.
General Elec. Co.
General Electronic
General Radio Co.
Hickok Elec. Inst. Co.
Millivac Instruments
Phaostron Co.
Rollin Co.
Sensitive Research Inst.
Shasta Div.
Sierra Electronic
Simpson Electric
Sylvania Elec. Prods.
Triplett Elec. Inst.

VOLTMETERS, Millivoltmeters

Advance Electronics
Assembly Products
Associated Research
Ballantine Labs.
Barber Colman
Beckman Instruments
Beckman & Whitley
Beede Elec. Inst. Co.
Biddle Co., James G.
Bristol Co.
Brunswick Instruments
Burlington Inst. Co.
Cambridge Inst. Co.
Chicago Ind. Inst.
Columbus Products Corp.
Commercial Research
Computer Co. of America
Dale Instruments
De Jur-Amsco Corp.
Dittmore & Freimuth
Doelcam Div.
Electric Des. & Mfg.
Electro-Mechanical Inst.
Electronic Development
Engelhard, Chas.
Esterline-Angus Co.
Federal Telephone & Radio
Feiler Engineering
Fielden Instrument
Foxboro Co.
Freed Transformer
Gar Electrical Instrument
General Elec. Co.
General Electronic
Greibach Instruments
Heath Co.
Hickok Elec. Inst. Co.
Industrial Control
International Instruments
J-B-T Insts.
Keithley Instruments
Lewis Engineering
Mag Electric
Manning, Maxwell & Moore
Marconi Inst.
Marion Electrical Inst.
Measurements Corp.
Meters, Inc.
Mil Instrument Corp.
Miller, M. C.
Millivac Instruments
Minneapolis-Honeywell
Non-Linear Systems
Norton-Elect. Inst. Co.
Pace Electrical Inst.
Phaostron Co.
Physics Research
Precision Apparatus
Pyrometer Instrument
Radio-City Products Co.
Rawson Electrical Inst.
RCA
Reiner Electronics
Roller-Smith
Scientific Specialties
Sensitive Research Inst.
Shallcross Mfg. Co.
Shasta Div.
Sierra Electronic
Simpson Electric
Southwestern Ind. Elec.
Standard Science Sup.
Sun Manufacturing
Supreme, Inc.
Thwing-Albert Inst. Co.
Trio Labs.
Triplett Electrical Inst.
United Electric Co.
United Optical Mfg.
Waveforms, Inc.
Welch Scientific
West Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Div.

VOLTMETERS, Millivoltmeters, A-c. Rectifier

Assembly Products
Ballantine Laboratories
Beckman Instruments
Bristol Co.
Burlington Instruments
Chicago Ind. Inst.
Columbus Products Corp.
Dale Instruments
De Jur-Amsco Corp.
Dittmore & Freimuth
Electric Des. & Mfg.
Electronic Development
Electronic Instrument
Feiler Engineering
Gar Electrical Instrument
General Electric
General Electronic
Hewlett-Packard
Mag Electric
Marion Electrical Inst.
Mil Instrument Corp.
Pace Electrical Inst.
Phaostron Co.
Physics Research
Prec. Apparatus Co.
Roller-Smith Co.
Sensitive Research Inst.
Shasta Div.
Simpson Electric
Southwestern Ind. Elec.
Special Instruments Lab.
Supreme, Inc.
Triplett Elec. Instrument
United Optical Mfg.
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst. Corp.

VOLTMETERS, Oxide Rectifier

Assembly Products
Burlington Instrument
Chicago Ind. Inst.
Clough-Brengle Co.
Columbus Products Corp.
Dale Instruments
De Jur-Amsco Corp.
Electric Des. & Mfg.
Electronic Dev. Lab.
Esterline-Angus Co.
Feiler Engineering
General Elec. Co.
General Electronic
General Radio Co.
Hickok Elec. Inst. Co.
Marion Electrical Inst.
Meters, Inc.
Pace Electrical Inst.
Physics Research
Precision Apparatus
Radio City Products Co.
Reiner Electronics
Roller-Smith
Simpson Electric
Sun Manufacturing
Supreme Inc.
Triplett Electrical Inst.
Triumph Mfg. Co.
United Electric Co.
Welch Scientific
West Corp.
Westinghouse Elec.
Weston Elec. Inst. Corp.

VOLTMETERS, Peak

Ballantine Labs.
Barber Labs., Alfred
Beta Electric Corp.
Clarke Inst. Corp.
Clough-Brengle Co.
Columbus Products Corp.
Control Devices
Electronic Dev. Lab.
Federal Telephone
Feiler Engineering
Fox Valley Inst.
General Elec. Co.
General Electronic
General Radio Co.
Gertsch Products
Hickok Elec. Inst. Co.
Industrial Devices Inc.
Kay Electric
Measurements Corp.
Non-Linear Systems
Physics Research
Radio City Products
Rawson Elec. Instrument
RCA
Rowe Engineering
Sensitive Research Inst.
Shepard Laboratories
Simpson Elec.
Supreme, Inc.
Triplett Elec. Inst.

VOLTMETERS, Recording

Alfax Paper & Engrg.
Audio Inst. Co.
Barber-Colman
Bristol Co.
Brush Electronic
Cambridge Inst. Co.
Columbus Products Corp.
Electrical Develop.
Engelhard, Chas.
Esterline-Angus Co.
Fielden Instrument
General Elec. Co.
Larson Instrument
Leeds & Northrup Co.
Massa Labs.
Millivac Inst.
Non-Linear Systems
Physics Research
Precise Measurements Co.
Roller-Smith
Sanborn Co.
Shasta Div.
Southwestern Ind. Elec.
Sound Apparatus
Sticht Co.
Westinghouse Elec.
Wheelco Div.

VOLTMETERS, Thermionic Rectifier

Ballantine Labs.
Barber Labs., Alfred
Cambridge Inst. Co.
Clippard Inst. Lab.
Columbus Products Corp.
Electronic Dev. Lab.
General Elec. Co.
General Radio Co.
Measurements Corp.
Meters, Inc.
Physics Research
Simpson Electric Co.
Sylvania Elec. Prod.
Triplett Elec. Inst.

VOLTMETERS, Thermo

Am. Elec. Sales Co.
Assembly Products
Beede Electric Inst. Co.
Cambridge Inst. Co.
Columbus Products Corp.
Dale Instruments
De Jur-Amsco Corp.
Electronic Development
General Elec. Co.
General Electronic
Greibach Instruments
Lewis Engineering
Meters, Inc.
Physics Research
Pyrometer Instrument
Rawson Electrical Inst.
Sensitive Research Inst.
Sun Manufacturing
Triplett Electrical Inst.
Welch Scientific
Westinghouse Elec.
Weston Elec. Inst. Corp.
Wheelco Inst. Co.

VOLTMETERS, Vacuum Tube

Aerovox Corp.
Amer. Chronoscope
Ballantine Labs.
Barber Labs., Alfred
Beckman Instruments
Beta Electric Corp.
Bradshaw Instruments
Burlington Instrument
Cambridge Inst. Co.
Clippard Inst. Lab.
Clough-Brengle Co.
Co-Design Corp.
Columbus Products Corp.
Computer Co. of America
Daven Co.
Donner Scientific
Electomic Designs, Inc.
Electro Prod. Labs.
Electronic Dev. Lab.
Electronic Eng'ng.
Electronic Instrument
Electronic Mfg. Co.
Electronic Meas. Corp.
Electronic Meas. Co.
Electro Products Lab.
Endevco Corp.
Federal Telephone
Feiler Engineering
Fluke Mfg. Co.
Freed Transformer
General Elec. Co.
General Radio Co.
Hewlett-Packard
Hickok Elec. Instrument
Industrial Control Co.
Industrial Test
Instrument Electronics
Jackson Elec. Co.
Kay-Lab.
Keithley Instruments
Marconi Instruments
Measurements Corp.
Millen Mfg. Co.
Miller, M. C.
Millivac Instruments
Minnesota Electronics
Phaostron Co.
Philco Corp.
Precise Development
Precision Apparatus Co.
Precision Electronics
Radio City Products Co.
RCA Tube Div.
Reiner Electronics
Scientific Specialties
Scott, Inc., Hermon
Shallcross Mfg. Co.
Shasta Div.
Sherron Metallic
Sierra Electronic
Simpson Electric
Southwestern Ind. Elec.
Supreme, Inc.
Sylvania Elec. Prod.
Technology Instrument
Televiso Co.
Trio Labs.
Triplett Electrical Inst.
Triumph Mfg. Co.
United Optical Mfg.
Victoreen Instrument
Waveforms, Inc.
Welch Scientific
Western Electro-Acoustics
Weston Elect. Inst. Corp.
Williamson Dev.
Yonkers Industries, Inc.

VOLT-OHMMETERS

Amer. Chronoscope
Associated Research
Beckman Instruments
Beede Elec. Instrument
Bradshaw Instruments
Burlington Inst. Co.
Chicago Indust. Inst.
Clippard Inst. Lab.
Clough-Brengle Co.
Columbus Products Corp.

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Three, four and five digit models.
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1 reading per second.
Oil-immersed switches for long life.

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DEL MAR AIRPORT
DEL MAR, CALIFORNIA

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gives continuous analysis of binary gas mixtures; especially useful in ammonia synthesis plants

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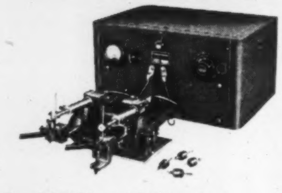

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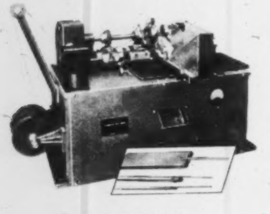

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Negus, T. S. & J. D.
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WATCHES, Comparing
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Ducommun Co.
Elgin National Watch
Hamilton Watch Co.
Jardur Import Co.
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Clebar Watch Co.
Ducommun Co.
Elgin National Watch
Hamilton Watch Co.
Jardur Import Co.
Negus, T. S. & J. D.
Waltham Watch Co.

WATCHES, Stop
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Biddle Co., James G.
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Clebar Watch Co.
Dietzgen Co., Eugene
Ducommun Co.
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Gallien, R. P.
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Sticht Co.
Triplett Elec. Inst.
United Electric Co.
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Hickok Elec. Inst. Co.
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Rawson Elec. Inst. Co.
Roller-Smith Inst.
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Bird Electronic
Brunswick Instruments
Computer Co. of America
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Troemmer, Henry
Voland & Sons, Inc.

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Torsion Balance Co.
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Welch Scientific Co.

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Torsion Balance Co.
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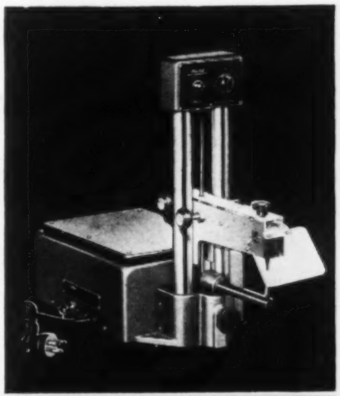

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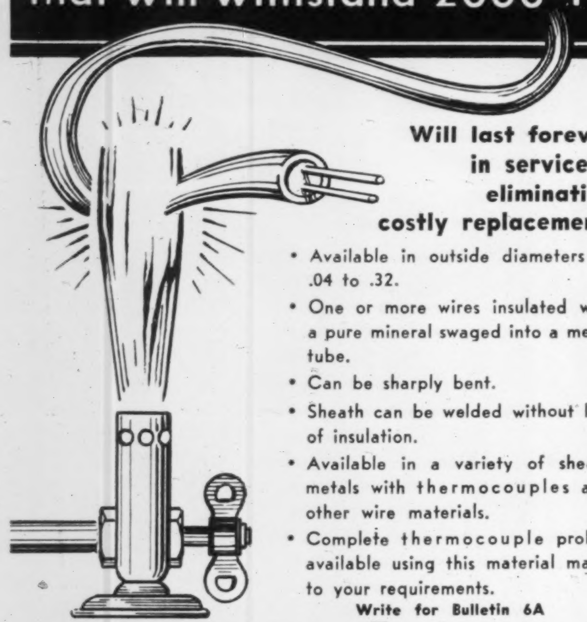

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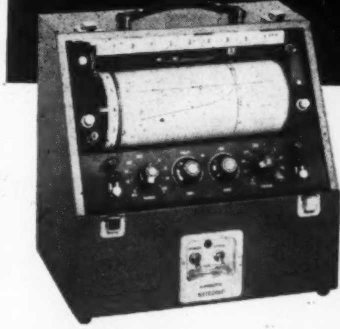

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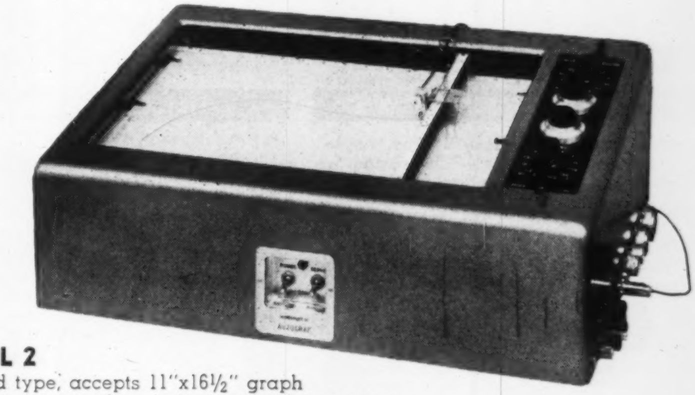

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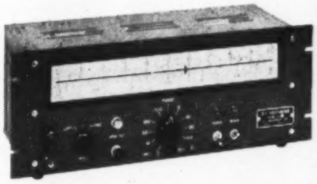
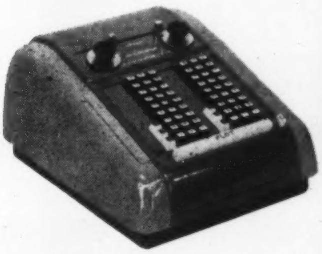
Flat bed type, accepts 11"x16½" graph paper; same speeds, sensitivities and ranges as MODEL 1; zero set anywhere on paper plus one full scale length of zero-offset; inputs provided for analog recording, point plotting from digital sources, and curve following for computer or data reduction use.



MODEL 20 DC VOLTMETER is a servo-actuated, fast, accurate and sensitive instrument. Has large, easy-to-read scale for general laboratory use where ranges from 3 millivolts to 300 volts are desired. For data handling it is furnished with a built-in Coleman digitizer and delivers digital output for operation of printers, typewriters, tape or card punches, etc.

MODEL 30 CARD TRANSLATOR converts information from punched cards into point form for automatic plotting. Handles up to 50 cards per minute, 10 to 200 counts per inch. Plugs directly into MODEL 2 recorder, controls both card reader and recorder for completely automatic operation.



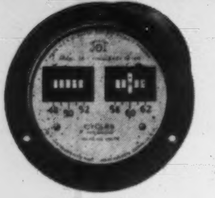
MODEL 40 KEYBOARD provides a convenient means for plotting large amounts of tabular data in point-curve form. Self-contained voltage source together with full three column keyboard in both X and Y axes; unit plugs directly into MODEL 2 AUTOGRAF.

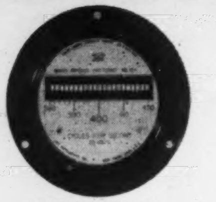
Bulletins describing these instruments are available and we'll be glad to send them to you. Write . . .

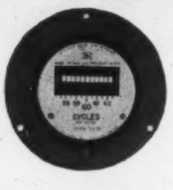
F. L. MOSELEY CO., 409 North Fair Oaks Avenue, Pasadena 3, California

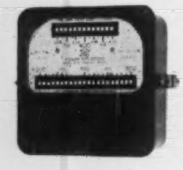
For more information circle **401** on inquiry card.

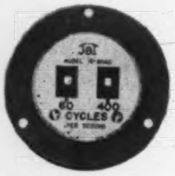
REED FREQUENCY METERS • ELAPSED TIME METERS
SWITCHES, Instrument and Test Equipment Quality: ROTARY, LEVER, TOGGLE for THE ELECTRONIC INDUSTRY


Model 30-F
Dual Range, Double Window


Model 36-FX-21
21-Reed Meter in 3½" Case


Model 34-FHXX
9-Reed in 3½" Sealed Case


Model 41-FX
Dual Range in 4" Case


Model 15-FHAC
2-Reed in 1½" Sealed Case

Model 33-FP-9M
Portable, Metal Case
TS-328 A/U (400 cy. type) Shown

VIBRATING REED FREQUENCY METERS

Meters illustrated are typical panel mounting or portable—for use where constant or known frequency is important to efficient operation of equipment.

- *Permanently Accurate* within ±0.3% or better at reference temperature, depending on the model. This accuracy is not affected by poor wave form, external magnetic disturbances, or voltage fluctuations.
- *Size and Type for Every Service.* Made in a wide variety of portable and panel case styles, reed groupings and frequency ranges from 12 to 650 cycles and above; 100-130 volts furnished unless otherwise specified.
- *Rugged Construction* of simplified, patented design, with no moving parts to wear out or get out of calibration. Ideal for field and mobile applications.
- *Suitable for Electronic Circuits* because of relatively low power consumption and J-B-T reeds with high Q and sharp, immediate response.

3½" and 2½" SEALED Types

3½ inch FHXX Meters sealed, glass-to-metal construction with solder terminals, meet or exceed the sealing and electrical requirements of JAN-1-6 and MIL-M-6A including the 3000 volt breakdown, and use the front mounting dimensions specified. Max. barrel diameter, 2¹¹⁄₁₆"; 2⅞" overall depth behind flange. While not regularly stocked, these meters are in volume production. New 2½" meters Model 21-FHXX available on special order.

1½" SEALED Types

Model 15-FHAC (illustrated half actual size). 60 and 400 cycles, 2 reeds, 8-10 volts, for cathode follower circuit. Widely used on audio oscillators to standardize output. Meets intent JAN-1-6 and amendments on sealed meters. Barrel, 1½" diameter; detachable flange, 2.094" diameter; solder terminals.

Model 15-FH Series (not illustrated)—Same case, sealed, 5 reeds, 58-62 cycles, 100-130 volts, or 390-410 cycles, 100-130 volts. Variations such as 6 reeds or 25 cycles available on special order.

ASK FOR CATALOG 555

ELAPSED TIME METERS

For Maintenance, Tube Life Data, and Operating Time Records—on Motor Generators, Transmitters, Receivers, Rectifiers, Test Set-ups, etc. *Model 31-EX* (illustrated) also known as running-time or total time meter, registers in ⅒ hours to 9,999.9 hours, then automatically resets. Normally stocked for 60 cycles, 110-130 volts. 3½" standard meter mounting. Variations such as 50 cycles; 230 volts; 0-99,999 hours; 3" rectangular case; and readings in minutes available on special order.

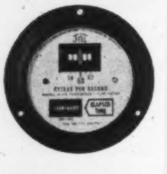
SEALED TIME METERS

Model 31-EHXX—Completely sealed meter, reading 0-9,999.9 hours, same as Model 31-EX above. Glass-to-metal construction, solder terminals, and 3½" detachable flange, all match XX metal frequency meter case.

Model 33-EHXX — Operates on 400 cycles, 110-125 volts, to read 0-9,999.9 hours in ⅒ hour steps. It is presently made only in 3½" flange sealed metal case, 2¾" diameter, 4" deep behind panel.

Model 21-EHXX—New. 2½" flange, sealed, full size counter.

FREQUENCY — TIME METERS

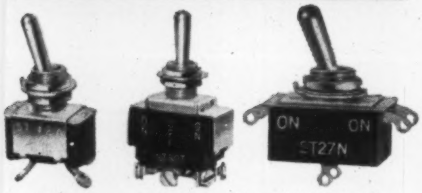


Combination Reed-Type Frequency — Elapsed Time Meters—One Meter Does the Work of Two. *Model 31-FE* (illustrated) pioneered by J-B-T, saves panel space and cost, and encourages periodic maintenance; 3¼" flange, metal case, 4¹¹⁄₃₂" overall depth, standard. 3½" case known as 31-FEX-1 supplied on custom orders. 5 reeds, 60 cycle range, standard; 7, 9, 11 reeds or 50 cycle range on special order.

DISTRIBUTOR SERVICE

Standard J-B-T items are available through authorized electronics parts distributors.

TOGGLE SWITCHES FOR JAN-S-23

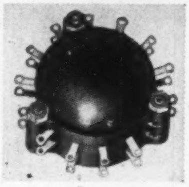


J-B-T now manufactures 56 models of toggle switches, designed for exceptional reliability, as in JAN-S-23 and Ordnance Standards DDAX. MIL-S-6745 (Air Force) designs are being added.

ST40, 42, 50, 52 series—Solid coin silver contacts and rocker arms, unique to J-B-T, add overload protection and keep contact resistance under .005 ohms. Nominal ratings 20 amp at 125 VAC, 10 amp, 250 VAC. See Bulletin TS-4.

ST12, 13, 16, 17, 22, 23, 26, 27 series—Nominally rated 6 amp at 125 VAC, 3 amp, 250 VAC; threaded bushings ²⁹⁄₆₄" or ¼" long. Current carrying parts heavily silver plated. See Bulletin TS-5

MOLDED ROTARY SWITCHES


Model MS-14-2

Shorting and Non-Shorting...14 or 20 Positions ...1 to 6 Decks. All moving contacts enclosed — eliminates dirt and corrosion...contact lugs permanently integrated into switch assembly...sturdy construction with 3-post deck suspension, double-grip collector arms, and rectangular drive shaft through decks for precision indexing...interchangeable, electrically and mechanically with J-B-T Series SS-14 and 20 position Laminated Switches.

Carrying capacity (not make-and-break): 1 amp.; maximum momentary, normal 5 amp.; maximum voltage between contacts and ground, 1000 volts R.M.S.; between decks and ground, 2000 volts R.M.S. Average contact resistance 0.007 ohms or less. Also available in 6-pole per deck double throw construction.

LAMINATED ROTARY SWITCHES

Model SS-14-2

Used widely in quality test equipment, portable instruments, inspection setups and avionics where trouble-free, dependable performance counts. Two basic types —14 pos. (2" dia.) or 20 pos. (2²³⁄₃₂" dia.) give extra contacts in minimum space. One to six decks.

LEVER ACTION SWITCHES

Model SS-14-1L4

Same top-quality parts as in SS-14 series. Single deck types may be mounted in groups ¾" between centers; 2 deck types, 1⁵⁄₁₆" between centers. For new ganged-lever types, SSG series, in 3, 4 or 5 positions, 2 to 10 decks, see print SK-74.

ASK FOR CATALOG 555

J-B-T INSTRUMENTS, INC. NEW HAVEN 8, CONN.

For more information circle **402** on inquiry card.

DESCRIPTIVE DIRECTORY

Of Manufacturers and Sole Representatives Selling Instruments and Devices Used for Measurement, Inspection, Testing and Automatic Control

Advertisers are indicated by bold-face type

A

Abrams Instrument Corp., 606 E. Shiawassee St., Lansing 1, Mich.
Aerial cameras, stereoscopes, triangulators, mapping projectors, aerial surveying instruments, time and count devices.

Accuracy Scientific Instrument Co., Inc., 2903 N. 12th St., Philadelphia 33, Pa.
Thermometers, hydrometers, thermo-hydrometers, thermo-regulators

Accurate Instrument Co., Inc., 3456 N. Clark St., Chicago 13, Ill.
Thermometers

Accurate Pyrometric Cone Co., Pataskala, Ohio
Seger cones

Ace Electronics Assocs. 125-129 Rogers Ave., Somerville 44, Mass.
Automotive and aviation test instruments; electrical components

Ace Glass Inc., 1938 N. W. Blvd., Vineland. N. J.
Chemical & laboratory glassware

ACF Electronics Div. ACF Industries. Inc., 800 N. Pitt St., Alexandria, Va.
Electrical and mechanical measuring instruments; gages; inspection devices.

ACF Industries, Inc., 1501 E. Ferry St., Detroit 11, Mich.

Acme Electric Corp., Cuba, N. Y.
Transformers & electrical test instruments

Acme Gauge & Inst. Co., Inc., 30 Main St., Brooklyn 1, N. Y.
Mechanical and thermal measuring and testing instruments
(See advertisement on page 125)

Acme Industrial Co., 1512 W. Lake St., Chicago. Ill.
Machine shop gages

Acme Regulator Co., Box 268, Tulsa 1, Okla.
High Pressure regulators

Acme Scientific Co., 1450 West Randolph St., Chicago 7, Ill.
Optical flats and light sources
(See advertisement on page 117)

Acromark Co., 9-13 Morrell St., Elizabeth 4, N. J.
Engraving, numbering and marking machines
(See advertisement on page 114)

Acro-Mu Switch Div., Acro Mfg. Co., 2030 E. Main St., Columbus 16, Ohio
Snap action switches

Adams & Westlake, Elkhart, Ind.
Relays

Adde & Co., 57 Kennebec St., Portland 2, Maine
Counters; automatic preset-count controllers

Adel Precision Products Corp., 10777 Van Owen St., Burbank, Calif.
Hydraulic actuators and remote control equipment

Advance Electric & Relay Co., 2435 N. Naomi St., Burbank, Calif.
Relays
(See advertisement on page 192)

Advance Electronics Co., 451 Highland Ave., Passaic, N. J.
Electronic instruments and components

Advanced Electronics Inc., 94 Silas Deane Hwy., Rocky Hill, Conn.
Electrical instruments and regulators; inspection devices

Aero-Coupling Corp., Burbank, Calif.
Tubing; valves

Aero Electronics Co., 1512 N. Wells St., Chicago 10, Ill.
Aircraft and industrial instruments

Aero Instrument Co., 11423 Vanowen St., No. Hollywood, Calif.
Airbourne and ground-station instruments

Aero Instrument Co., 5105 Denison Ave., Cleveland 2, Ohio
Airspeed tubes

Aero Research Instrument Co., 1901 N. Hermitage Ave., Chicago 22, Ill.
Aviation instruments; flowmeters; Pitot tubes; thermocouples
(See advertisement on page 240)

Aerolite Electronic Hardware Corp., 507 26th St., Union City, N. J.
Radio hardware, connectors

Aeromarine Instrument Co., Inc., 385 Gerard Ave., New York 51, N. Y.
Aircraft, marine and industrial instruments
(See advertisement on page 127)

Aeroquip Corp., 300 South East St., Jackson, Mich.
Dynamic pressure gages; tubing; valves; flexible rubber hose & reusable fittings

Aerotronic Associates, P.O. Box 419, Concord, N. H.
Electrical and optical testing instruments

Aetna Scientific Co., Second & Spring Sts., Everett 49, Mass.
Stills; autoclaves

Aerovox Corporation, 740 Belleville Ave., New Bedford, Mass.
Capacitors & resistors

AGA Div., See Elastic Stop Nut Corp.
(See advertisement on page 193)

Agfa Ansco, Binghamton, N. Y.
Electronic photometer

Ahrendt Instrument Co., 4910 Calvert Rd., College Park, Md.
Power supplies; servomechanism testers

Ainsworth & Sons, Inc. Wm., 2151 Lawrence St. Denver 2, Colo.
Analytical, micro, assay & pulp balances & weights, pocket transits

Air Associates, Industrial St., Teterboro, N. J.
Aircraft and missile automatic controls and power units; motors

Air Equipment Co., 2248 E. 37th St., Los Angeles 58, Calif.
Motors; generators; tachometers; governors; servomechanisms

Air Instruments, 6829 W. Highland Ave., Chicago 31, Ill.
Aerological instruments; dust counters; smoke bombs; psychrometers; accessories

Air Marine Motors, Inc., 369 Bayview Ave., Amityville, L. I., N. Y.
Fractional-hp motors

Airborne Accessories Corp., 1414 Chestnut St., Hillside 5, N. J.
Power Units

Airborne Instruments Laboratory, Inc., 160 Old Country Rd., Mineola, L. I., N. Y.
Polar and rectangular coordinate recorders, electronic instruments

Aircraft Armaments, Inc.
Commercial Products Div.,
P. O. Box 1777, Baltimore 3, Md.

Aircraft Electronics Associates, Inc., 94 Silas Deane Highway, Rocky Hill, Conn.
Aircraft instruments and testers

Aircraft-Marine Products, Inc., 2100 Paxton St., Harrisburg, Pa.
Repair kits, connectors

Aircraft Radio Corp., Boonton, N. J.
Electronic Instruments

Aircraft Transformer Corp., Willow & West Sts., Long Branch, N. J.
Pulse and high-frequency transformers

Airdesign Incorporated, 241 Fairchild Ave., Upper Darby, Pa.
Audio-frequency equipment, transformers

Airdraulics Engineering, Inc., Overhill Ave., Rye, N. Y.
Torque Testers

AiResearch Mfg. Co., 9851 Sepulveda Blvd., Los Angeles 45, Calif.
Airborne and ground-station instruments, computers, actuators

Airflo Instrument Co., P. O. Box 30, Glastonbury, Conn.
Special probes for measuring gas velocity, direction, temperature and pressure

Airite Products Co., Inc., 3528 Union Pacific Ave., Los Angeles 23, Calif.
Fire detectors

Airmatic Valve, Inc., 7317 Associate Ave., Cleveland 9, Ohio
Control valves and operating devices

Air-O-Tronics, Box 31, Lancaster, Calif.
Electrical and electronic instruments and components; adapters and hardware

Airpath Instrument Co., Lambert Field, St. Louis 21, Mo.
Magnetic instruments; compasses

Airpax Products Co., Middle River, Baltimore 20, Md.
Power supplies; relays; electrical and electronic components

Airplane & Marine Instruments Co., 15 William St., New York 5, N. Y.
Absolute pressure gage

Airtron, Inc., 1101 Elizabeth Ave., Linden, N. J.

Alco Mfg. Co., 4011 Cuming St., Omaha 3, Neb.
Radioactivity instrumentation

Alco Valve Co., 865 Kingsland Ave., St. Louis 5, Mo.

Automatic controllers; control valves; pressure regulators

Alconox, Inc., 61 Cornelison Ave., Jersey City 4, N. J.

Alden Electronic & Impulse Recording Equipment Co., Alden Research Center, Westboro, Mass.

Alden Proudcts Co., Inc., 117 N. Main St., Brockton 64, Mass.
Oscilloscopes, Radiosondes, fascimile recorders
(See advertisement on page 187)

Alden Systems Co., Alden Research Center, Westboro, Mass.

Alfa Photo Corp., 303 W. 42nd St., New York 18, N. Y.
Optical filters; test instruments

Alfab Manufacturing Co., 8320 Millet St., Houston 12, Texas
Laboratory furniture

Alfax Paper & Engr. Co., Washington St., Westboro, Mass.
Accelerometers, barometers & clinometers

Align-A-Scope, Inc., 2123 Stoner Ave., West Los Angeles 25, Calif.
Optical tooling instruments

Alina Corp., 401 Broadway, New York 13, N. Y.
Clocks, differential pressure gages, time meters and switches, toolmakers' microscopes
(See advertisement on page 81)

All American Tool & Mfg. Co., 8027 Lawndale, Skokie, Ill.
Vibration fatigue testers

Allard Instrument Corp., 30 Broad St., New York 4, N. Y.
Aircraft instruments; power units; motors; switches; components

Allegany Instrument Co., Inc., 1000 Oldtown Rd., Cumberland, Md.
Pressure recorders; amplifiers

Allegheny Plastics, Inc., Thorn Run Road, Coraopolis, Pa.
Recording charts

Allen-Bradley Co., 136 W. Greenfield Ave., Milwaukee 4, Wis.
Electric control apparatus

Alliance Mfg. Co., Lake Park Blvd., Alliance, Ohio
Fractional-hp motors

Allied Control Co., Inc., 2 East End Ave., New York 21, N. Y.
Relays, switches & remote control equipment

Allied Engrg. Div., Allied Int'l Inc., Connecticut & Richard Aves., South Norwalk, Conn.
Electrical and electronic instruments; gas analyzers; color analyzers; mechanical testers; motor-generator sets

Allied Engraving & Stamping Co., 161 Ellicott St., Buffalo 3, N. Y.
Instrument panels

Allied Radio Corp., 100 N. Western Ave., Chicago, Ill.
Amplifiers and audio-frequency equipment

Allis-Chalmers Mfg. Co., P. O. Box 512, Milwaukee 1, Wis.
Position indicators, frequency load & phase regulators

Alloy Bellows Engineering Co., 18125 Roseland Rd., Cleveland 12, Ohio
Temperature pressure and vacuum controllers

Alpha Corp., 65 Harvard Ave., Stamford, Conn.
Instrument lubricating oils and oil testers

Alpha-Lux Co., Inc., 155 John St., New York, N. Y.
Moisture testers

Alteneder & Sons, Theo., 1219 Spring Garden St., Philadelphia 23, Pa.
Drawing instruments
(See advertisement on page 112)

Alto Scientific Co., 4037 El Camino Way, Palo Alto, Calif.
Electrical test instruments

Amerac, Inc., 116 Topsfield Rd., Wenham, Mass.
Electrical and electronic instruments

American Balance Corp., 48 Potter Ave., New Rochelle, New York
Balances, scales and weights

American British Electric Corp., 57 Park Ave., New York 16, N. Y.
Voltage-dividing resistors

American Chain & Cable Co., Helicoid Gage Div., 929 Connecticut Ave., Bridgeport 2, Conn.
Bourdon tube gages & pressure indicators

American Chain & Cable Co., R-P&C Valve Division, Inc., Reading, Pa.
Electrically-operated valves; bar-stock valves

American Chronoscope Corp., 316 W. First St., Mt. Vernon, N. Y.
Time study instruments, steam meters

American Communications Corp., 308 Broadway, New York 7, N. Y.
Audio-frequency equipment, battery chargers, instrument panels

American Condenser Co., 4410 North Ravenwood Ave., Chicago 40, Ill.
Capacitors

American Cystoscope Makers, Inc., 1241 Lafayette Ave., New York 59, N. Y.
Bore and internal surface inspection devices

American Electroneering Corp., 2040 Colorado Ave., Santa Monica, Calif.
Electronic instruments

American Electronic Labs., Inc., 641 Arch Street, Phila. 6, Pa.
Electrical and electronic instruments; photoelectric instruments

American Electronic Mfg. Inc., 9503 W. Jefferson Blvd., Culver City, Calif.
Analog computers; system simulators, components

American Gage & Machine, See Simpson Elec. Div.

American Gas Accumulator Co., see Elastic Stop Nut Corp.

American Gas Furnace Co., 988 Lafayette Street, Elizabeth 4, N. J.

American Helicopter Div., Fairchild Engine & Airplane Corp., 1800 Rosecrans Ave., Manhattan Beach, Calif.
Bridge-balance instrumentation; amplifiers
(See advertisements on pages 87, 173, 201)

American Hydromath Corp., 25-20 43rd Ave., Long Island City 1, N. Y.
Nautical instruments; quality-control instruments; slide rules

American Indicator-Paper Co., 4611 N. Kostner Ave., Chicago 30, Ill.
Chemical indicator papers

American Industrial Instrument Co., 46 Florence Street, Springfield 5, Mass.
Automatic assembly machines (custom)

American Instrument Co., 8010-8020 Georgia Ave., Silver Spring, Md.
Scientific instruments & materials testing apparatus

American Instrument Corp., 1500 South Broadway, St., Los Angeles 15, Calif.
Optical and photographic instrumentation accessories.

American Kloeckner-Moeller Corp., 4113 E. 11 St., Tulsa, Okla.
Industrial measuring and automatic-control instruments; control valves; relays; components

American Laubscher Corp., 250 West 57th St., New York 19, N. Y.

American Lens Co., 45 Lispenard St., New York, N. Y.
Cathode-ray tubes and lenses

American Machine & Foundry Co., 1085 Commonwealth Ave., Boston, Mass.
Electrical and electronic instruments and components; medical and biological instruments.

American Machine & Metals, Inc., See Gotham Instrument Div.; Riehle Test. Mach. Div. or U. S. Gauge Div.
(See advertisement on page 123)

American Measuring Instruments Corp., 21-25 4th Ave., Long Island City 1, N. Y.
Precision measuring instruments

American Meter Co., 1513 Race St., Philadelphia 2, Pa.
Tinned case & ironcase positive displacement gas & air meters, pressure reducing regulators, meter testing apparatus, indicating, recording & integrating flowmeters, rate volume & liquid level controllers & remote controllers
(See advertisements on pages 22-23)

American Name Plate & Mfg. Co., see Anco Instrument Div.

American Optical Co., Instrument Div., Box A, Buffalo 15, N. Y. Projectors Div., 80 Heard. St., Chelsea, Mass.
Scientific optical instruments, projection apparatus, testing equipment and optical parts, microscopes, microtomes, refractometers, spectrometers, visual colorimeters, illuminators, delineascopes, magnifiers, and special lenses, prisms and mirrors for industrial and educational purposes.

American Paulin System, 1524 So. Flower St., Los Angeles 15, Calif.
Meterological instruments, altimeters, barometers
(See advertisement on page 82)

American Phenolic Corp., 1830 S. 54th Ave., Chicago 50, Ill.
Regular and special connectors; antennas; coax cable

American Photocopy Equip. Co., 1920 W. Peterson Ave., Chicago 26, Ill.
Photocopy equipment

American Platinum Works, 231 N. J. Railroad Ave., Newark, N. J.

American Rectifier Co., 93 Lafayette St., New York 13, N. Y.
Rectifiers, power supplies

American Relay & Controls, Inc., 4901 W. Flournoy St., Chicago 44, Ill.
Relays, switches, coils, etc.

American Research Corp., 11 Brook St., Bristol, Conn.
Testers for environment conditions, for product properties, etc.; instrument calibrating

American Temperature Indicating Co., 1017 Summit St., Toledo 4, Ohio
Electrical resistance thermometers

American Thermo-Electric Co., 7269 Santa Monica Blvd., Los Angeles 48, Calif.
Vacuum, separate heater & contact type thermocouples
(See advertisement on page 220)

American Time Products, Inc., 580 Fifth Ave., New York 36, N. Y.
Timing Systems, frequency standards
(See advertisement on page 46)

American Tradair Corp., Chrysler Bldg., 405 Lexington Ave., New York 17, N. Y.
Electronic instruments and components; radioactivity counters, shields, etc.

Amerline, 1753 N. Honore St., Chicago 22, Ill.
Radio tube testers; spark plug testers

Ames Co., B. C., 131 Lexington St., Waltham, Mass.
Comparator & dial gages, length measuring devices

Ames Precision Machine Works, 131 Lexington St., Waltham 54, Mass.
Instrument lathes; hardness testers

Amglo Corp., 2037 W. Division St., Chicago 22, Ill.
Gas discharge tubes; constant-speed d-c. timer motors
(See advertisement on page 152)

Amperex Electronic Corp., P. O. Box 418, 230 Duffy Ave., Hicksville, L. I., N. Y.
Electron tubes; x-ray tubes

Amperite Corp., 561 Broadway, New York 12, N. Y.
Microphones
(See advertisement on page 194)

Ampex Electric Corp., 934 Charter St., Redwood City, Calif.
Magnetic tape recorder.

Amplifier Corp. of America, 398 Broadway, New York 13, N. Y.
Amplifiers

Amplitronix, Inc., 155 W. 72 St., New York 23, N. Y.

Amsler Buehler Ltd., 2120 Greenwood, Evanston, Ill.
Industrial and laboratory testing instruments and machines

Amthor Testing Instrument Co., Inc., 45-53 Van Sinderen Ave., Brooklyn 7, N. Y.
Physical testing machines
(See advertisement on page 212)

Analysis Sales Co., 1827 Union Commerce Bldg., Cleveland 14, Ohio
Impact recorders

Analytical Measurements, Inc., 585 Main St., Chatham, N. J.
pH Probes and Meters
(See advertisement on page 167)

Anatran Engineering Corp., 10 Congress St., Pasadena 2, Calif.
Electrical and electronic components

Anco Instr. Div., Am. Name Plate & Mfg. Co., 4254 W. Arthington St., Chicago 24, Ill.
Electronic instruments; industrial stethoscope

Anders Lykens Corp., Lykens, Pa.
Instrument airdryers

Anderson, Arthur R., 110 Woodbury Ave., Springdale (Stamford), Conn.
Strain gages

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Balancing machines

Anderson Machine Shops, Inc., Brook Road, Needham Heights 94, Mass.
Testing machines; yarn testers and computers

Anderson Co., V.D., 1935 West 96th St., Cleveland 2, Ohio
Air cleaners, scrubbers and strainers; steam traps

Andreasen, Holger, Inc., 703 Market St., San Francisco 3, Calif.
X-ray equipment

Andrew Technical Supply Co., 6972 N. Clark St., Chicago 26, Ill.
Laboratory apparatus

ANelex Corp., 150 Causeway St., Boston, Mass.
High-speed data-printing systems

Anemostat Corp. of America, 10 E. 39th St., New York 16, N. Y.
Airspeed indicators; thermometers; static pressure indicators

Anetsberger Bros., Inc., Northbrook, Ill.
Temperature and humidity test chambers

Angle Computor Co., Inc., 1709 Standard Ave., Glendale 1, Calif.
Universal angle computers

Ann Arbor Instrument Works, 725 Packard St., Ann Arbor, Mich.
Testing Machines

Annin Company, 6570 E. Telegraph Rd., Los Angeles 22, Calif.
Control valves
(See advertisement on page 233)

Annis Company, R. B., 1101 N. Delaware St., Indianapolis 2, Ind.
Permeameters, balancing machines
(See advertisement on page 142)

Anton Electronic Labs., Inc., 1226 Flushing Ave., Brooklyn 37, N. Y.
Electrical, electronic and nucleonic instruments; electron tubes; components

A-P Controls Corp., 2450 N. 32 Street, Milwaukee 45, Wisc.
Automatic control systems; power units; valves

Applied Physics Corp., 362 W. Colorado St., Pasadena 1, Calif.
Cary recording quartz spectrophotometer, Vibrating reed electrometer, color analyzers

Applied Research Labs., 3717 Park Place, Glendale 8, Calif.
Spectromechanical testing apparatus including spectrographs, projection comparators, densitometers & power source units for arc & spark analysis

Applied Science Corp. of Princeton, P. O. Box 44, Princeton, N. J.
Research and development in electronics and physics

Arca Regulators, Inc., Upper Montclair, N. J.
Hydraulic & air operated controls

Arco Electronics, Inc., 103 Lafayette St., New York, N. Y.

Aremac Associates, 50 So. San Gabriel Blvd., Pasadena 10, Calif.
Optical instrumentation; cameras
(See advertisement on page 89)

Arens Controls, Inc., 2017 Greenleaf St., Evanston, Ill.
Remote control systems

A.R.F. Products Inc., 7627 Lake St., River Forest, Ill.
Electrical instrumentation, remote control equipment

Arga Div., Beckman Instruments, Inc., 220 Pasadena Ave., So. Pasadena, Calif.
Electrical instruments; testing equipment

Argus Cameras, Inc., Ann Arbor, Mich.
Photographic and optical instruments; lenses; components

Aridifier Div., see Logan Engineering

Aristo Grid Lamp Products, Inc., 106-23 Metropolitan Ave., Forest Hills, L. I., N. Y.
Visible spectrum and ultraviolet lamps

Aristo Import Co., Inc., 630 Fifth Ave., New York 20, N. Y.
Stop watches

Arizona Tool & Die Co., 31 E. Rillito St., Tucson, Ariz.
Gages; micrometers; optical comparators; shop equipment

Ark Engineering Co., 431 W. Tabor Rd., Philadelphia 20, Pa.
Electrical measuring and testing equipment

Arlin Products, Inc., 13541 Auburn Ave., Detroit 23, Mich.
Electronic inspection equipment; gage heads; micrometers

Arlington Aluminum Co., 19011 W. Davison Rd., Detroit 23, Mich.
Racks and supports for tubes and cables

Arma Corporation, 254 36th St., Brooklyn, N. Y.
Automatic inspection equipment

Armour & Co., Curled Hair Dept., North Benton Rd., Alliance, Ohio
Packaging materials

Arnhold Ceramics, Inc., 1 East 57th St., New York 22, N. Y.
Electrical and electronic components

Arnold Engineering Co., P. O. Box G, Marengo, Ill.
Permanent magnets

Arnoux Corp., 1357 S. Hawthorne Blvd., Hawthorne, Calif.
Flight test instrumentation; general purpose amplifiers; thermometers

Arrow Electronics, Inc., 65 Cortlandt St., New York 17, N. Y.
Electronics equipment and parts distribution
(See advertisement on page 114)

Arrow-Hart & Hegeman Electric Co., 103 Hawthorne St., Hartford 6, Conn.
Magnetic, mercury & relay switches

Art Wire & Stamping Co., 1 Boyden Pl., Newark 2, N. J.
Precision wire forms

Ashton Valve Company, 161 First St., Cambridge, Mass.
Pop safety & relief valves, pressure gage, gage testers & master pilot & master pressure gages

Askania Regulator Co., 240 E. Ontario St., Chicago 11, Ill.
Automatic control instruments

Assembly Products, Inc., Chesterland 11, Ohio
Electrical indicating instruments and accessories
(See advertisements on pages 101, 166, 184, 192)

Associated Research, Inc., 3758 W. Belmont Ave., Chicago 18, Ill.
Vibrotest insulation testing equipment. Special measuring & testing instruments of electrical nature

Associated Specialties Co., 1751 Main St., Orefield, Pa.
Constant-current supplies
(See advertisement on page 178)

Associated Valve & Engr. Co., 1150 W. Marquette Road, Chicago 21, Ill.
Automatic controllers; control valves; components

Astron Corp., 255 Grant Ave., E. Newark, N. J.
Capacitors

Atkomatic Valve Co., Inc., 545 N. Abbott St., Indianapolis 25, Ind.

Atlantic Research Corp., 812 Fairfax St., Alexandria, Va.
Pressure vibration and acoustic pickups

Atlas Electric Devices Co., 4114 N. Ravenswood Ave., Chicago 13, Ill.
Fade-Ometer, Weather-Ometer, Launder-Ometer

Atlas Engineering Co., 3 Edgewood St., Roxbury, Mass.
Power supplies; amplifiers; electronic components

Atlas Exploration Co., 1911 West Alabama St., Houston 6, Texas
Geophysical instruments

Atlas Valve Co., 282 South St., Newark 5, N. J.
Regulator valves

Atmosphere Control Co., 5315 Chester Ave., Philadelphia 43, Pa.
Testing instruments and machines; gas analyzers

Atomic Instrument Co., 84 Massachusetts Ave., Cambridge 39, Mass.
Radioactive detectors and electronic instruments
(See advertisement on page 108)

Atomic Research Corp., P. O. Box 205, Colorado Springs, Colo.
Mass spectrographs; geophysical instruments; light sources

Atomlab, Inc., 489 Fifth Ave., New York 17, N. Y.
Radiation instruments, apparatus and supplies

Atwood & Morrill Co., Salem, Mass.
Automatic control systems; control valves

Audio Development Co., Transformer Div., 2833 13th Ave., S., Minneapolis 7, Minn.
Transformers, audio frequency equipment

Audio Instrument Co., 133 W. 14th St., New York 11, N. Y.
Audio-frequency equipment

Austin Company Special Devices Division, 76 Ninth Ave., New York 11, N. Y.
Beta-gamma hand and foot checker; computers and components; electrical and electronic; measuring instruments and automatic-control system; components

Auth Electrical Specialty Co., Inc., 422 E. 53 St., New York 22, N. Y.
Signaling devices

Authorized Manufacturers Service, 919 Wyckoff Ave., Brooklyn, N. Y.
Electrical and mechanical measuring and testing instruments and components

Auto Engraver Co., Ridgefield, Conn.
Contour and 3-dimensional milling machines

Autocall Co., Shelby, Ohio
Electrical signaling, control & metering devices

Autoclave Engineers, Inc., P. O. Box 1027, Erie, Pa.
High pressure autoclaves, valves and thermocouples

Automatic Control Co., 105 University Ave., St. Paul 4, Minn.
Circuit switches for automatic level controls, automatic timing & sequence controllers

Automatic Electric Mfg. Co., 10 State St., Mankato, Minn.
Time switches & interval timers

Automatic Electric Sales Co., 1833 W. Van Buren St., Chicago 7, Ill.
Telephone signaling & communication apparatus
(See advertisement on page 17)

Automatic Scale Co., Inc., 591 Hudson St., New York 14, N. Y.
Automatic scales

Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.
Solenoid operated valves & automatic electric control apparatus

Automatic Temperature Control Co., 5212 Pulaski Ave., Philadelphia 44, Pa.
Timers, time control and specialty engineering. Valves & valve controllers, relays.
(See advertisements on pages 205, 224, 225)

Automatic Valve Controller Co., Box 268, Tulsa 1, Okla.
Automatic valve control

Autotron Co., Danville, Ill.
Automatic inspection devices

A-V Mfg. Corp., 730 Fifth Ave., New York 19, N. Y.
Magnetic tape and data recording insts.; data handling systems and readouts.

Aviation Engineering Corp., 34-56 58th St., Woodside, N. Y.
Industrial measuring and automatic-control devices; remote-control systems; testers

Electrical and electronic instruments and components; regulators; computer components

Automatic Steam Products Corp., 140 W. 31st Street, New York 1, N. Y.
Water demineralizers; steam generators

Avien, Inc., 58-15 Northern Blvd., Woodside, L. I., N. Y.
Aircraft electrical and mechanical instruments; thermometers; switches

Avion Div., ACF Industries, Inc., 299 Highway 17, Paramus, N. J.
Electrical and mechanical measuring instruments and automatic control systems

Avionic Products Engr. Corp., Route No. 46, Dover, N. J.
Aircraft measuring and automatic control instrumentation

B

Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh 8, Pa.
Industrial instruments

Badger Meter Mfg. Co., 2371 North 30th St., Milwaukee 45, Wis.
Liquid meters

Bailey Meter Co., 1041 Ivanhoe Rd., Cleveland 10, Ohio
Metering and control equipment for power plants & industrial processes. Power plant instruments; boiler meter, meter combustion control operating directly from boiler meter, three-element feed water control, steam superheat control, desuperheating & pressure reducing control. Also metering & control equipment for sewage treatment, water supply & processing industries
(See advertisements on pages 85, 101, 102, 120, 122, 128, 184, 189, 196, 201, 204, 222, 229)

Baird Associates, 33 University Road, Cambridge 38, Mass.
Specialized physical & optical instruments including complete line of spectrographic & x-ray diffraction equipment

Baker Co., Maplewood, Maine
Testers, cleaners and tooling for ball bearings and small parts

Baker & Co., Inc., 113 Astor St., Newark 5, N. J.
Thermocouple wire; microchemical apparatus; rupture disks; precious metals

Baker Compass Co., Melrose, Mass.
Compasses

Balco Research Labs., 49-53 Edison Place, Newark 2, N. J.
Capacitors; radio noise filters

Baldwin-Lima-Hamilton Corp., Testing Machine Dept., Philadelphia 42, Pa.
Universal testing machines

Ballantine Labs., Inc., Boonton, N. J.
Precision electronic voltmeters and accessories
(See advertisement on page 34)

Ballastran Corp., 1701 N. Calhoun St., Fort Wayne 7, Ind.
Instrument and power transformers

Balteau Electric Corp., New & Meadow Sts., Stamford, Conn.
Electrical and x-ray instrumentation; cameras

Baltic Metal Products Co., 122 Sutton St., Brooklyn 22, N. Y.
Custom built panels, rack and console housings.
(See advertisement on page 134)

Baltimore Biological Laboratory, Inc., 1640 Gorsuch Ave., Baltimore 18, Md.
Laboratory filling machines, pumps, etc.

Bar-Ray Products, Inc., 209 25th St., Brooklyn 32, N. Y.
X-ray equipment

Barber-Colman Co., P. O. Drawer 99, Rockford, Ill.
Automatic controlling instruments for temperature, humidity, pressure, liquid level, moisture regain, motor-operated valves, solenoid valves, electric power units, damper controllers, voltage sensitive relays,

associated switches & relays, fractional H. P. motors, geared motor units & hardness testers

Barber Laboratories, Alfred W., 34-04 Francis Lewis Blvd., Flushing, L. I., N. Y.
Voltmeters

Barbour Stockwell Co., 205 Broadway, Cambridge, Mass.
Tachometers

Barclay Inst. Div., Patent Button Co., Waterbury 20, Conn.
Polargraphic equipment; flame photometers

Barksdale Valves, 5125 Alcoa Ave., Los Angeles 58, Calif.
Control valves; valve-operating devices; pressure regulators, auxiliaries

Barnes Development Co., 213 W. Baltimore Pike, Lansdowne, Pa.
Electrical instruments; automatic inspection devices; motion-picture cameras
(See advertisements on pages 87, 97, 213)

Barnes Co., W. F. & John, 301 S. Water St., Rockford, Ill.
Automatic control equipment

Barnstead Still & Sterilizer Co., Inc., 2 Lanesville Terrace, Boston 31, Mass.
Water stills

Bart-Messing Corp., 229 Main St., Belleville, N. J.

Bartelt Engineering Co., 1214 Patridge Ave., Beloit, Wis.
Pedestal micrometers

Barrows Porcelain Co., Langdon Farm & Penn R. R., Cincinnati 13, Ohio
Steel, glass-coated (plated) pyrometer tubes

Barry Controls, Inc., 700 Pleasant St., Watertown 72, Mass.
Vibration mountings and isolators

Barton Instrument Corp., 1429 S. Eastern Ave., Los Angeles 22, Calif.
Flowmeters & gages
(See advertisement on page 8)

Basler Electric Co., 601 Fifth St., Highland, Ill.
Transformers; inductors; chokes

Bastian-Blessing Co., 4201 W. Peterson St., Chicago 30, Ill.
Regulating valves

Bausch & Lomb Optical Co., 738 St. Paul St., Rochester 2, N. Y.
Optical instruments for industrial, scientific & educational use including microscopes, colorimeters, refractometers, photomicrographic & metallographic equipment, contour measuring projector, optical glass & special optical systems

Bayside Watch Tool Co., 20-02 Utopia Pkwy, Whitestone 57, N. Y.
Machines, tools and dies for watch, clock and instrument industries

Beacon Gage Co., 11 River St., Wellesley, Mass.
Pressure gages

Beam Instruments Corp., 350 Fifth Ave., New York 1, N. Y.
Electronic instruments, cameras, testers

Bear Manufacturing Co., 2030 5th Ave., Rock Island, Ill.
Balancing machines

Beck Bros., 421 W. Sedgley Ave., Philadelphia 40, Pa.
Resistors

Beck Co., Harold, 3640 N. Second St., Philadelphia 40, Pa.
Pyrometer controllers

Becker Co., Richard F., 3020 N. Cicero, Chicago 41, Ill.
Plug-in timers for on-off cycling, process and production timing, etc.
(See advertisement on page 224)

Becker Div., Christian see Torsion Balance Co.

Beckman, Inc., Arnold O., 1020 Mission St., So. Pasadena, Calif.
Scientific and industrial instruments; automatic gas analyzers and detectors; radioactivity detectors; dosemeters

Beckman Instruments, Inc., 2500 Fullerton Rd., Fullerton, Calif.
pH instruments and electro-metric pH equipment for completely automatic indication, control and recording

Beckman & Whitley, 985 San Carlos Ave., San Carlos, Calif.
Anemometers, special cameras

Beede Electrical Instrument Co., Penacook, N. H.
Small electrical panel instruments

Bel-Art Products, 4917 Murphy Place, West New York, N. J.
Plastic tubing and cylinders; instrument covers

Bell & Howell Co., 7100 McCormick Rd., Chicago 45, Ill.
Motion picture equipment including cameras, projectors & accessories

Bell Sound Systems, Inc., 555 Marion Rd., Columbus 7, Ohio
Audio frequency instruments; amplifiers; hi-fi components

Bellco Glass, Inc., 413 N. 4th St., Vineland, N. J.
Glass apparatus, viscosity tubes, pipettes and other components

Bellmore Gear Corp., 2307 Bellmore Ave., Bellmore, N. Y.
Precision gears and gear assemblies for differentials, subminiature motor gear heads, gyros, servos, etc.
(See advertisement on page 131)

Belock Instrument Corp., 111th St. & 14th Ave., College Point, N. Y.
Military and naval fire-control instruments; magnetic clutches; servo testing devices

Bendix Aviation Corp., 1104 Fisher Bldg., Detroit, Mich.
Aircraft, marine and ground instrumentation; control and telemetering systems; testing instruments; meteorological instruments

Bendix Aviation Corp., Eclipse-Pioneer Div., 95 First St., Teterboro, N. J.
Electrical & Mechanical Aircraft Instruments remote control systems

Bendix Aviation Corp., see Friez Instrument Div.

Bendix Aviation Corp., Pacific Div., 11600 Sherman Way, N. Hollywood, Calif.
Airborne and ground instruments, industrial measuring, telemetering and remote control systems

Bendix Aviation Corp., Red Bank Div., Eatontown, N. J.
Radioactivity instruments; generators

Benson-Lehner Corp., 2340 Sawtelle Blvd., Los Angeles 64, Calif.
Computers; digitizers; trace readers; printers; components

Berge, J. & H., 145 Hudson St., New York 13, N. Y.
Laboratory supplies

BERKSHIRE LABMARKERS

The simple, easy way to add time marks to C.R. 'scope traces. Generate pulses from sine waves. Wholly self-contained. Model 1-U $18.50

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Model 19-G, 3-terminal $3.50

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Mod.	Imp.	Rise Time	Percent Droop 1μs	2μs	10 μs	Price
PT-1	100	.04μs	20	50	80	8.95
PT-2	100	.04μs	20	30	70	8.95
PT-3	120	.03μs	20	40	75	5.95

SP-1 Kit of one each of above transformers $18.75

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For checking speed of motors, machines, turntables. Flashes 60 times a second.
Chromed case, reflector, 6 ft. cord $9.95

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For sorting, grading, and comparing metal parts by rapid check of critical magnetic of electrical properties.
Model 44 ....$710.00

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708 Bank Village
Greenville, N. H.

For more information circle **403** on inquiry card.

Berger & Sons, Inc., C. L., 37 Williams St., Boston 19, Mass.
Surveying instruments

Berger Scientific Supplies, Inc., 37 Williams St., Boston 19, Mass.
Laboratory Supply House

Berkeley Scientific Div., Beckman Inst., Inc., 2200 Wright Ave., Richmond, Calif. Electrical and electronic instruments for analysis and computing; frequency meters and standards; automatic-control systems

Berkshire Labs., 582 Bank Village, Greenville, New Hampshire
Optical, electrical and electronic instruments
(See advertisement on page 246)

Berkshire Transformer Co., 15 South Avenue, New Milford, Conn.
Transformers; variable-voltage transformers

Berndt-Bach, Inc., 6962 Romaine St., Hollywood 38, Calif.
Sound-on-film cameras; electrical and electronic instruments; components

Beseler Co., Charles, 60 Badger Ave., Newark 8, N. J.
Optical projectors, galvanometer projectors, delineascopes

Best Scientific Glass App. Wks., 2449 N. Clybourn St., Chicago 14, Ill.

Beta Corp., The, Forest Ave., at Ridge Rd., P. O. Box 8625, Richmond 26, Va.
Electrical and electronic instruments; pickups; components
(See advertisement on page 235)

Beta Electric Corp., 333 E. 103d St., New York 29, N. Y.
Electrical and electronic instruments; power supplies; components

Bethlehem Apparatus Co., Front & Depot Sts., Hellertown, Pa.
Laboratory Apparatus, mercury cleaning machines

Better Coil & Transformer Corp., Goodland, Ind.
Coils; transformers

Bill Jack Scientific Instruments Co., 143 S. Cedros Ave., Solana Beach, Calif.
Timers; motors; cameras; hygrometers

Betts & Betts Corp., 551 W. 52nd St., New York 19, N. Y.
Multiple circuit timers, controls, time delay relays, motor driven thermostatic interrupters

Beva Laboratory, P. O. Box 478, Trenton, N. J.
Power supplies; wave analyzers, amplifiers

B & F Instruments, Inc., 4732 N. Broad St., Philadelphia 41, Pa.
Torque and acceleration measuring equipment; bridges
(See advertisements on pages 74, 86)

Biddle Co., James G., 1316 Arch St., Philadelphia 7, Pa.
Insulation testers, ground testers & ohmmeters, speed-measuring instruments, frequency meters, sliding-contact rheostats
(See advertisements on pages 121, 145, 209, 211)

Bidwell Instrument Co., 107 Troy Place, N. W., Canton 3, Ohio
Microchemical laboratory apparatus; custom built research instruments

Biggs Co., Carl H. 2255 Barry Ave., Los Angeles 64, Calif.
Encapsulating materials
(See advertisement on page 115)

Bin-Dicator Co., 13946 Kercheval, Detroit 15, Mich.
Automatic bin level indication & control
(See advertisement on page 103)

Binswanger & Co., 645-655 Union Ave., Memphis 1, Tenn.
Lenses, prisms & filters, Glass of every description

Bio-Rad Laboratories, 800 Delaware St., Berkeley, Calif.
Water deionizers; radioactive sources; crystals

Bird Electronic Corp., 1800 E. 38th St., Cleveland 14, Ohio
Switches, wattmeters

Bird & Co., Richard H., 1 Spruce St., Waltham 54, Mass.
Jewel bearings
(See advertisement on page 140)

J. Bishop & Co., Platinum Works, Malvern, Pa.
Laboratory apparatus; pyrometer tubes

Black & Decker Mfg. Co., 715 Pennsylvania Ave., Towson 4, Md.
Truck scales; testing machines

Black, Syvalls & Bryson, Inc., 7500 E. 12 St., Kansas City 3, Mo., Climax Controls Div., Box 1529, Tulsa, Okla.
Automatic controllers, governors, valves

Black & Webster, Inc., 445 Watertown St., Newton 58, Mass.
Pellet presses, time study apparatus

Blake Co., Edward, 437 Cherry St., West Newton 65, Mass.
Dimensional gages, surface-finish comparators and standards, surface-finish testing sets

Bliley Electric Co., 200 Union Station Bldg., Erie, Pa.
Quartz piezo-electric crystals

Bliss & Co., Inc., John, 84 Pearl St., New York 4, N. Y.
Marine instruments

Block Mfg. Co., Dairy Rd., Parktour, Md.

Blue M. Electric Co., 138th & Chatham St., Blue Island, Ill.
Furnaces and furnace-control systems

Bock Machine Co., 3618 Colerain Ave., Cincinnati 23, Ohio
Erichsen sheet metal testing machine

Bodine Electric Co., Ohio St., & Oakley Blvd., Chicago 12, Ill.
Motors, all types of windings from 1/2000 to 1/6 hp. speed reducers & nonreducer motors

Bodnar Industries, Inc., 19 Railroad Ave., New Rochelle, N. Y.
Electrical instruments; components; panels
(See advertisement on page 166)

Boehmke Optical Co., 3737 Bird Road, Miami 33, Fla.
Precision optical manufacturers

Boekel & Co., Wm., 509-519 Vine St., Philadelphia 6, Pa.
Laboratory apparatus

Boeing Airplane Co., 7762 E. Marginal Way, P. O. Box 3107, Seattle 14, Wash.
Computers

Bogue Electric Mfg. Co., 52 Iowa Ave., Patterson 3, N. J.
Voltage and speed regulators; magnetic amplifiers and controllers; AC and DC motors and generators; switchboards
(See advertisement on page 247)

Bolsey Corp. of America, 118 E. 25th St., New York, N. Y.
Optical equipment, cameras and projectors

Boonton Radio Corp., P. O. Box 390, Boonton, N. J.
Radio test instruments

Booth Co., Arthur E., 265 So. Alexandria Ave., Los Angeles 4, Calif.
Portable meter testers

Borg Corp., Geo. W., Equip. Div. 120 S. Main St., Janesville, Wis.
Potentiometer voltage dividers, slide wire rheostats
(See advertisement on page 37)

Borden Engineering Co., 63 Clinton Ave., New Providence, N. J.
Ground resistance meters, pipe locators, signal generators

Boston Auto Gage Co., 70 West St., Pittsfield, Mass.
Liquid level gages and allied lines

Bostrom-Brady Mfg. Co., Stonewall & Bailey Sts., S.W., Atlanta, Ga.
Surveying instruments

Boulin Instrument Corp., 65 Madison Ave., New York 16, N. Y.
Chronometric hand tachometers, wound stroboscopes, electrical stroboscopes, speed indicators & portable & stationary tachometers
(See advertisement on page 208)

Bourns Laboratories, 6135 Magnolia Ave., Riverside, Calif.
Pressure and displacement pickups, resistors
(See advertisement on page 174)

Bowen & Co., Inc., 4712 Bethesda Ave., Bethesda 14, Md.
Cement testers

Bowmar Instrument Corp., 2415 Pennsylvania St., Fort Wayne 4, Ind.
Counters; speed reducers; mechanical components

Bowser, Inc., Fort Wayne Div., 1302 E. Creighton Ave., Fort Wayne 2, Ind.
Liquid meters

Bowser Technical Refrigeration, Terryville, Conn.
Testing cabinets, low temperature, high altitude, relative humidity

Boylston Steam Specialty Co., 116 W. Illinois St., Chicago 10, Ill.
Regulating valves

Brabender Corp., 244 Saddle River Rd., Rochelle Park, N. J.
Industrial measuring & control apparatus for plastic & viscous materials; semi-automatic moisture testers

Bradley Laboratories, Inc., 168 Columbus Ave., New Haven 11, Conn.
Photoelectric cells

Bradshaw Instruments Co., 42 Flatbush Ave., Brooklyn 17, N. Y.
Electrical instruments

Brady Co., W. H., 727 W. Glendale Ave., Milwaukee 12, Wis.
Markers, labels, safety signs

Brand Co., William, North & Valley Sts., Willimantic, Conn.
Flexible control cable

Branson Corp., Boonton, N. J.

Branson Instruments, Inc., 430 Fairfield Ave., Stamford, Conn.
Thickness gages, tube & sheet metal
(See advertisement on page 217)

Braun Corp., 2260 East 15th St., Los Angeles 21, Calif.
Chemicals & laboratory supplies

Braun-Knecht-Heimann Co., 1400 Sixteenth St., San Francisco, Calif.
Laboratory supplies

Bray Optical Co., 345 W. 1st St., Los Angeles 4, Calif.
Lenses, prisms & optical instruments
(See advertisement on page 161)

Breeze Corporations, 700 Liberty Ave., Union, N. J.
Multiple connectors; radio ignition shielding

Brew Co., Inc., Richard D., Airport Rd., Concord Plains, N. H.

Bridgeport Thermostat Div., Robertshaw-Fulton Controls Co., 1225 Connecticut Ave., Bridgeport 1, Conn.
Metallic bellows and thermostats

Brigham Co., R. B., 4139 Mayfield Drive, Toledo 10, Ohio
Photoelectric controls

The Electronic Control Handbook

By RALPH R. BATCHER, E.E.

Radio Engineering Consultant, Consulting Editor *Electronics Industries*

and WILLIAM MOULIC

Associate Editor *Electronic Industries.*

Paper, 5¾x8¾ inches, viii + 344 pages. 295 illustrations, numerous tables. References at end of each chapter, and Bibliography. 6-page Index, 1946.

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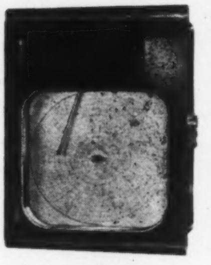
Write for Bulletins A120, 036, A115, B226, and C305.



Series
500 Controller

BRISTOL COMPANY

112 Bristol Rd., Waterbury 20, Conn.

For more information circle **405** on inquiry card.

Brinkmann Instruments, Inc., 378-380 Great Neck Rd., Great Neck, L. I., N. Y.
Photomicrographic equipment; balances

Bristol Company, Waterbury 20, Conn.
Recording & automatic controlling instruments for pressure, vacuum, draft, absolute pressure, humidity, liquid level, flow, pH value, temperature (pyrometers & thermometers) & speed. Included are recording barometers voltmeters, ammeters, wattmeters, dairy instruments, machine operation, motion & operation recorders, control valves, telemetering instruments, process cycle controllers, coordinated process control, time-temperature and time-pressure controllers, potentiometers, air operated & electric controllers & thermal converters. Dilatometers & combustible gas & vapor detectors
(See advertisements on pages 105, 123, 173, 180, 184, 197, 219, 222, 248)

Bristol Engineering Corp., Beaver Dam Rd., & Oak Lane, Bristol, Pa.
Industrial and Laboratory instrumentation; power supplies; components

Bristol Motor Div., See Vocaline Co. of America

British Electronic Sales Co., 23-03 45th Rd., Long Island City 1, N. Y.
Electronic instruments & equipment

Brodie Co., Inc., Ralph N., Alvarado & West 137th Ave., San Leandro, Calif.
Positive displacement petroleum meters & accessories

Brooke Engineering Co., Inc., 4517 Wayne Ave., Philadelphia 44, Pa.
Electrically actuated pressure & flow controllers

Brookfield Engineering Laboratories, Inc., 2 Porter St., Stoughton, Mass.
Synchro-Lectric viscosimeter

Brooklyn Thermometer Co., 217-09 Merrick Blvd., Springfield Gardens, N. Y. Laboratory and recording thermometers

Brooks Rotameter Co., P. O. Box 432, Lansdale, Pa.
Flowmeters
(See advertisement on page 119)

Brown Electro-Measurement Corp., 4635 S.E. Hawthorne Blvd., Portland 15, Ore.
Electrical instruments and components

Brown-Morse Co., 110 E. Broadway Heights, Muskegon, Mich.
Laboratory furniture

Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.
Machine shop instruments

Browning Laboratories, Inc., 750 Main St., Winchester, Mass.
Frequency meters, signal generators, cathode-ray oscillographs

Brubaker Instrument Specialties, 2315 Waverly Pl., Waukegan, Ill.
Motion-picture and still cameras (custom); optical components

Bruning Co., Inc., Chas., 4700 Montrose Ave., Chicago 41, Ill.
Drawing & surveying instruments

Brunson Instrument Co., 1405 Walnut St., Kansas City 6, Mo.
Surveying Instruments

Brunswick Instruments, P. O. Box 813, New Brunswick, N. J.

Brush Electronics Co., 3405 Perkins Ave. Cleveland 14 Ohio
Oscillographs; vibration and motion pickups; amplifiers; surface comparators and analyzers; electrical testing instruments; components
(See advertisement on page 3)

Bryant Chucking Grinder Co., P. O. Box 739, Springfield, Vt.
Screw thread gages

Buchanan Electrical Products Corp., 225 Route 29, Hillside, N. J.
Terminal blocks, terminals

Bud Radio, Inc., 2118 East 55th St., Cleveland 3, Ohio
Electronic components

Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y.
Liquid meters for measurement of cold water, hot water, oils, chemicals. Integrating registers, cumulative, setback, or predetermined control
(See advertisement on page 146)

Buffalo Scale Co., 46 Letchworth St., Buffalo 13, N. Y.
Scales

H. H. Buggie & Co., 726 Stanton St., Toledo 1, Ohio
Connectors, plugs, jacks, clips

Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I.
Instruments for indicating recording controlling flow, liquid level, pressure, temperature, and weight

Bullard Co., E. D., 275 Eighth St., San Francisco 3, Calif.
Gas leak detectors

Bunnell & Company J. H., 81 Prospect St., Brooklyn 1. N. Y.
Relays & switches

Burgess Battery Co., Freeport, Ill.
Dry Batteries
(See advertisement on page 84)

Burke Electric Co., 8544 Grand River Ave., Detroit 4, Mich.
Fractional horsepower motors

Burke & James, Inc., 321 S. Wabash Chicago 4, Ill.
Photographic equipment for research and laboratory departments

Burke, Louis, 41 John St., New York, N. Y.
Stop watches and chronometers

Burling Instrument Co., 16 River Rd., Chatham, N. J.
Automatic temperature controllers

Burlington Instrument Co., 203 North 3rd St., Burlington, Iowa
Electrical control apparatus

Burndy Engineering Co., Norwalk, Conn.
Connectors, plugs and jacks

Burnell & Co., Inc., 45 Warburton Ave., Yonkers, N. Y.
Wave filters; components

Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Pa.
Scientific instruments & laboratory supplies

Burroughs Corp., Electronic Inst. Div., 1209 Vine St., Phila. 7, Pa.
Computers; automatic regulators; electrical and electronic instruments and components

Burrows Equipment Co., 1316 Sherman Ave., Evanston, Ill.
Moisture testers

Burton Mfg. Co., 11201 W. Pico Blvd., Los Angeles 64, Calif.
Industrial & Aircraft electrical & optical instruments
(See advertisement on page 181)

Bush Associates, G. F., Box 175, Princeton, N. J.
Rubber, plastics and textile testers; laboratory apparatus

Bushnell Optical Corp. of America, 240 Bushnell Bldg., Pasadena 1, Calif.
Optical instruments and supplies

Butler Manufacturing Corp., 5516 Dorsey Lane, Washington 16, D. C.
Counters; digital computers switches; components

B. W. Controller Corp., 2200 E. Maple Rd., Birmingham, Mich.
Floatless liquid level controls
(See advertisement on page 104)

C

Cadillac Gage Co., 20316 Hoover Road, Detroit 5, Mich.
Dimensional gages

Cady & Co., E. J., 630 N. Harlem Ave., River Forest, Ill.
Non destructive testers for physical properties

Cal-Astro Optical Labs., 1625 E. Washington St., Pasadena 7, Calif.
Optical instruments and components

Calculagraph Co., 300 Sussex St., Harrison, N. J.
Elapsed time indicator

Calectron, Inc., 2444 Beverly Rd., St. Paul 4, Minn.
Fluorimeters

Calidyne Co., 120 Cross St., Winchester, Mass.
Accelerometers and vibration pickups

California Magnetic Control Corp., 7245 Atoll Ave., N. Hollywood, Calif.
Electrical instruments; testers; transformers

Callahan & Co., E. J., 5 North Haven St., Baltimore, Md.
Laboratory supply house

Cal-Tronics Corp., 11307 Hindry St., Los Angeles, Calif.
Electrical and electronic instruments and control systems; radar equipment; panels; components

Cambridge Instrument Co., Inc., 3074 Grand Central Terminal, New York 17, N. Y.
Scientific & industrial instruments

Cambridge Thermionic Corp., 447 Concord Ave., Cambridge 38, Mass.
Monochromators; electric counters

Cameron Iron Works, Inc., P. O. Box 1212, Houston, Texas
Pressure gages; dynamometers; valves and valve-operating units

Cameron Surgical Specialty Co., 666 W. Division St., Chicago 10, Ill.
Surgical instruments

Campbell Co., J. A., 645 Wardlow Rd., Long Beach 7, Calif.
Thermometer wells & automatic controllers

Canadian Radium & Uranium Corp., 630 Fifth Ave., New York 20, N. Y.
Luminous, phosphorescent and fluorescent paints
(See advertisement on page 113)

Cannon Electric Co., 3209 Humboldt St., Los Angeles 31, Calif.
Multiple circuit connectors for instruments
(See advertisement on page 39)

Cannon Instrument Co., Box 812, State College, Pa.
Temperature and pressure controllers; viscometers

Canoga Corp., 5955 Sepulveda Blvd., Van Nuys, Calif.
Radio and radar instrumentation and equipment

Carad Corp., 2850 Bay Rd., Redwood City, Calif.
Radio-frequency instruments and components

Carbide & Carbon Chemicals Co., 30 E. 42nd St., New York 17, N. Y.
Instrument lubricating oils

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park P. O., Detroit 32, Mich.
Permanent magnets, magnetic alloys

Cargille Scientific, Inc., 117 Liberty St., New York 6, N. Y.
Chemical laboratory & photographic devices. Immersion liquids for inspecting glass & quartz

Cardwell Mfg. Corp., Allen D., 97 Whiting St., Plainville, Conn.
Electrical and electronic instrumentation; control systems; power units; radar equipment; industrial TV; components

Carlingo Commodities Corp., 15 William St., New York 5, N. Y.
Pyrometers and temperature controllers

Carruthers & Fernandex, Inc., 1501 Colorado Ave., Santa Monica, Calif.
Control valves; power units; solenoids

Carter Motor Co., 2644 N. Maplewood Ave., Chicago 47, Ill.
DC to AC converters, dynamotors, generators, magmotors, inverters.
(See advertisement on page 155)

Carter Parts Co., 213 Institute Place, Chicago 10, Ill.
Relays, resistors, rheostats & switches

Carver, Inc., Fred S., One Chatham Road, Summit, N. J.
Testing machines; laboratory presses; high-pressure instrumentation

Cash Co., A. W., P. O. Box 551, Decatur, Ill.
Combustion control instruments
(See advertisement on page 32)

Cash Valve Mfg. Corp., A. W., 6619 East Wabash, Decatur 60, Ill.
Pressure, vacuum and temperature controllers; control valves

CBS-Hytron, 100 Endicott St., Danvers, Mass.
Electronic tubes

CDC Control Services, Inc., 400 S. Warminster Rd., Hatboro, Pa.
Control systems: Air facility, wind tunnel, positional, motion, program, weighing, coordinated

Cedar Engineering Inc., 5806 West 36th St., Minneapolis 16, Minn.
Computers; amplifiers; synchros; drives; accelerators

Central Instrument Co., 565 E. Milwaukee, Detroit 2, Mich.
Pressure and vacuum indicators and recorders

Central Research Labs., Inc., Red Wing, Minn.
Electronic instruments; microwave equipment

Central Scientific Co., 1700 Irving Park Blvd., Chicago 13, Ill.
Scientific instruments & laboratory apparatus
(See advertisement on page 141)

Centralab Div., Globe Union Inc., 919y E. Keefe Ave., Milwaukee 1, Wis.
Capacitors, rheostats, resistors & switches

Centrico, Inc., 75 West Forest Ave., Englewood, N. J.
Centrifuges

Century Geophysical Corp., 1333 N. Utica Ave., Tulsa 10, Okla.
Geophysical instruments
(See advertisement on page 165)

Century Instrument Co., 565 E. Milwaukee Ave., Detroit 2, Mich.
Temp. regulators and automatic recording controllers for water heaters, process or plating tanks; diaphragm valves.
(See advertisement on page 105)

C.G.S. Labs., 391 Ludlow St., Stamford, Conn.
Electrical instruments; computers; remote control system

Chace Co., W. M., 1600 Beard Ave., Detroit 9, Mich.
Thermostatic bimetals

Chandler & Stedman 398 A Newton St., Waltham 54, Mass.
Special laboratory apparatus

Chapman Laboratories, P. O. Box 207, West Chester, Pa.

Charvos-Roos Corp., 185 Hackensack St., East Rutherford, N. J.
Drawing instruments

Chatham Electronics Corp., Div. of Gera Corp., 630 W. Mt. Pleasant Ave., Livingston, N. J.
Radioactivity measuring instruments; probes; vacuum tubes

Chatillon & Sons, John, 85 Cliff St., New York 38, N. Y.
Iso-elastic springs
(See advertisement on page 24)

Chelsea Clock Company, 284 Everett Ave., Chelsea, Mass.
Clocks & clock movements

Chemalloy Electronics Corp., Gillespie Airport, Santee, Calif.
Microwave instrumentation; alloys and solders

Chemical Rubber Co., 2310 Superior, East, Cleveland 14, Ohio
Laboratory supplies

Chemiquip Co., 6 E. 97th St., New York, N. Y.
Pressure snubbers; mercury traps

Chesapeake Instrument Corp., Shadyside, Md.
Ultrasonic equipment; sound detectors

Chester Cable Corp., Chester, N. Y.
Flexible control cable; coax; elec. cable & wire

Chicago Apparatus Co., 1735 No. Ashland Ave., Chicago 22, Ill.
Laboratory supplies

Chicago Condenser Co., 3255 W. Armitage Ave., Chicago 47, Ill.
Capacitors

Chicago Dial Indicator Co., 180 N. Wacker Dr., Chicago 6, Ill.
Machinist's dial indicators

Chicago Electric Tachometer Co., 111 Lake St., Madison, Ohio
Electric tachometers; portable tachometers, speed indicators

Chicago Electronic Engineering Co., 3223 W. Armitage Ave., Chicago 47, Ill.
Transformers

Chicago Industrial Inst. Co., 536 W. Elm St., Chicago 10, Ill.
Radio, electronic & industrial test equipment

Chicago Surgical and Electrical Co., 217 N. Desplaines St., Chicago 6, Ill.
Laboratory supplies

Chicago Standard Transformer Corp., Addison & Elston, Chicago 18, Ill.
Instrument & power transformers

Cinch Manufacturing Co., See Jones Div.

Cincinnati Clock & Instrument Co., 1060 Hulbert St., Cincinnati 14, Ohio
Circuit breaker analyzer

Cincinnati Div., Bendix Aviation Corp., 203 West Third St., Cincinnati 2, Ohio

Cincinnati Sub Zero Products, 3932 Reading Rd., Cincinnati 29, Ohio
Temperature & altitude cabinets

Cincinnati Time Recorder Co., 1733 Central Ave., Cincinnati 14, Ohio
Time recorders

Cinema Engineering Co., 1100 Chestnut St., Burbank, Calif.
Electrical and electronic instruments and components
(See advertisements on pages 197, 206)

Circle Gauge Co., P. O. Box 2524, Hollywood 28, Calif.
Piston ring gages

Circon Component Co., 17544 Raymer St., Northridge, Calif.
Instrument and electronic hardware; contact alloys
(See advertisement on page 100)

Circuit Instruments Inc., 1927 First Ave., S., P. O. Box 355, St. Petersburg, Fla.
Accelerometers, resistors, remote metering equipment

Cities Service Oil Co., 54 Wall St., New York 5, N. Y.
Automotive and aviation service instruments

Clairex Corp., 50 West 26 St., New York 10, N. Y.
Radiation and photoelectric instruments and components

Clare & Co., C. P., 3101 Pratt Blvd., Chicago 45, Ill.
Relays, electric counters & electric mechanical specialties

Clark Controller Co., 1146 E. 152nd St., Cleveland 10, Ohio
Machine tool control systems

Clark Cooper Co., Palmyra, N. J.
Timers, alarms and controllers

Clark Instrument Co., Inc., 10202 Ford Road, Dearborn, Mich.
Hardness testers

Clark Mfg. Co., 1830 E. 38th St., Cleveland 14, Ohio
Torque-measuring equipment; dynamometers; magnetic-particle clutches

Clark & Sons, Inc., Alvan, 58 Day St., West Somerville, Mass.
Optical & astronomical instruments

Clarke Insts. Div., National Electrical Machine Shops, Inc., 919 Jesup-Blair Drive, Silver Spring, Md.
Electrical indicating instruments and accessories

Clarostat Mfg. Co., Inc., Dover, N. H.
Resistors

Clary Multiplier Corp., 408 Junipero St., San Gabriel, Calif.
Computers; readout machines; computer components; printers; recorders

Clebar Watch Co., 521 Fifth Ave., New York 17, N. Y.
Stop watches, timers & chronographs

Cleveland Fuel Equipment Co., 1111 Brookpark Rd., Cleveland 9, Ohio
Furnace controllers, pyrometers & gages

Cleveland Instrument Co., Inc., 735 Carnegie Ave., Cleveland 15, Ohio
Precision measuring instruments

Clevite-Brush Development Co., 540 E. 105th St., Cleveland 8, Ohio
Industrial and laboratory instrumentation and components; magnetic recorders and memory devices; digital computers

Clifford Mfg. Co., Div., Standard-Thomson Corp., 152 Grove St., Waltham 54, Mass.
Metallic bellows & diaphragms; thermostatic assemblies; packless valves

Clifton Precision Products Co., Inc., Broadway & Marple Ave., Clifton Heights, Pa.
Synchros
(See advertisements on pages 156, 157)

Climax Controls Div., see Black, Sivalls and Bryson, Inc.

Clippard Instrument Laboratory, Inc., 7390 Colerain Ave., Cincinnati 14, Ohio
Electronic apparatus and electrical instruments

Clough-Brengle Co., 6014 Broadway, Chicago 40, Ill.
Electrical instruments, communication testing instruments

Cobehn, Inc., Passaic Ave., Caldwell, N. J.
Equipment and solvents for cleaning instruments and precision components
(See advertisement on page 130)

Co-design Corp., 751 Main St., Winchester, Mass.
Surface-finish testers; pain-threshold apparatus; thermopiles; accessories

Cohn Corp., Sigmund, 121 So. Columbus Ave., Mt. Vernon, N. Y.
Galvanometer suspension ribbon

Cole Co., H., 82 North High St., Columbus 15, Ohio
Surveying instruments

Coleman Engineering Corp., 6040 W. Jefferson Blvd., Los Angeles 16, Calif.
Counters; digitizers; fluid meters; optical gaging and tooling equipment; accessories
(See advertisement on page 110)

Coleman Instrument Co., 716 So. Troost Ave., Tulsa 10, Okla.
Oscillographs

Coleman Instruments, Inc., 318 Madison St., Maywood, Ill.
Electrical measuring instruments for technical applications

Colin Campbell Co., Inc., Westville Ave. Ext., Danbury, Conn.

Collins Microflat Co., 2326 E. 8th St., Los Angeles 21, Calif.
Surface plates
(See advertisement on page 137)

Collins Radio Co., Cedar Rapids, Iowa
Electronic apparatus

Color Television, Inc., 952 San Carlos Ave., San Carlos, Calif.
Automatic testers for electric circuits and equipment

Colortone Electronics Inc., 100 Frank Road, Hicksville, L. I., N. Y. (14)
Annunciators; electronic hardware, components

Columbia Electric Mfg. Co., 4519 Hamilton Ave., N. E., Cleveland 14, Ohio
Rheostats, instruments, shunts, switchboards & special electrical equipment

Columbia Technical Corp., 5 E. 57th St., New York 22, N. Y.
Testing equipment for motors, windings, coils, etc.

Columbus Products Corp., 1010 Saw Mill River Rd., Yonkers, N. Y.
Electrical measuring instruments; relays

Colvin Laboratories, Inc., 364 Glenwood Ave., East Orange, N. J.
Pressure, displacement and acceleration pickups; voltage-dividing resistors; components

Comar Electric Co., 3349 W. Addison St., Chicago 18, Ill.
Relays; solenoids; switches

Combustion Control Div., Electronics Corp. of America, 718 Beacon St., Boston 15, Mass.
Combustion controls

Commercial Controls Corp., 1 Leighton Ave., Rochester, N. Y.
Data handling and processing equipment; remote controls

Commercial Iron Works, 2424 Porter St., Los Angeles, Calif.
Flowmeters; orifice plates and fittings.
(See advertisement on page 162)

Commercial Optical Co., P.O. Box 474, Huntington, W. Va.
Optical components; low-reflection lenses

Commercial Products, Inc., Div. of Aircraft Armaments, Inc., 4003 Seven Mile Lane, Baltimore 8, Md.
Microwave and r-f instruments; ConelRadio

Commercial Research Labs., Inc., 20 Bartlett St., Detroit 3, Mich.
Laboratory instruments for automotive, aircraft, railway & allied industries

Communication Accessories Co., 110th & 71 Hwy., Hickman Mills, Mo.
Transformers; filters; amplifiers; components

Communication Measurements Lab., Inc., 350 Leland Ave., Plainfield, N. J.
Testers, rectifiers, voltage regulators, communication measuring equipment

Compar Instrument Co., 455 Douglas Road, Holland, Mich.
Comparators, surface-finish microscopes and testers

Computer Corp. of America, Div. of Bruno-New York Industries Corp., 460 W. 34th St., New York 1, N. Y.
Analog computers; microwave instrumentation; accessories.
"IDA" integro-differential analyzer; electrical and electronic instruments and components

Computer Control Co., Inc., 92 Broad St., Wellesley 57, Mass.
Laboratory apparatus; digital computers and control systems; components

Computer Engineering Assocs., Inc., 350 N. Halstead St., Pasadena 8, Calif.
Amplifiers; power supplies; electronic components

Computer Instrument Corp., 1964 Utica Ave., Brooklyn 34, N. Y.
Position level and dimensional instrumentation; resistors; components

Computer Research Corp., 3348 W. El Segundo Blvd., Hawthorne, Calif.
Analog-digital computers; electronic counters; components

Comtor Company, 83 Rumford Ave., Waltham 54, Mass.
Precision internal & external comparator-type diameter gages

Conant Bros. Co., 427 Riverside Ave., Medford 55, Mass.
Non-lubricated plug valves

Conant Laboratories, 6500 O St., Lincoln 5, Neb.
Dry disc rectifiers

Conax Corp., 4515 Main St., Buffalo 21, N. Y.
Thermocouples; tubes & fittings

Condenser Products Co., 7517 North Clark St., Chicago 26, Ill.
Capacitors

Conn, Ltd., C. G., Electronics Div., 1101 E. Beardsley Ave., Elkhart, Ind.
Stroboscopes

Connecticut Telephone & Electric Div., Great American Industries, Inc., Meriden, Connecticut
Electronic devices

Connelly Inc., 3154 S. California Ave., Chicago 8, Ill.
Gages & manometers, B T U indicator & H_2S tester

Conoflow Corp., 2100 Arch St., Philadelphia 3, Pa.
Valves, automatic controls
(See advertisements on pages 105, 182, 188, 234)

Conrad, Inc., 141 Jefferson St., Holland, Mich.
Test chambers

ConRay Corp., 29 W. Apple St., Dayton 2, Ohio
Dimensional gaging and automatic inspection equipment; power supplies; tools

Consolidated Engineering Corp., 300 N. Sierra Madre Villa, Pasadena 15, Calif.
Geophysical instruments, mass spectrometers, vibration measuring equipment

Consolidated Vacuum Corp., 1775 Mt. Reed Blvd., Rochester 3, N. Y.
Pressure and vacuum instruments and control accessories; altitude test chambers

Continental Carbon, Inc., 13900 Lorain Ave., Cleveland 11, Ohio
Standard and special resistors

Continental Electric Co., 715 Hamilton, Geneva, Ill.
Photoelectric tubes & equipment

Continental Electric Equipment Co., Box 1055, Cincinnati 1, Ohio
Control boards and housings; electrical distribution equipment

Continental Equipment Co., Coraopolis, Pa.
Valves

Continental Foundry & Machine Co., See Copes Vulcan Div.

Control Corporation, 718 Central Ave., Minneapolis 14, Minn.
Automatic & remote control equipment

Control Devices, Inc., 8299 Nine Mile Rd., Van Dyke, Mich.
Process-control and dimensional control instrumentation; ballistic instruments
(See advertisement on page 235)

Control Electronics Company, Inc., 1925 New York Ave., Huntington Station, N. Y.
Delay lines

Control Engineering Co., 8900 Alpine Avenue, Detroit 4, Mich.
Process timing and automatic-control devices; inspection and testing instruments; counters

Control Engineering Corp., 560 Providence Highway, Norwood, Mass.
Mass-flow meters; pressure instruments; fire-control instruments; aircraft instruments
(See advertisement on page 36)

Control Products, Inc., 306 Sussex St., Harrison, N. J.
Thermostatic switches

Cook Electric Co., 2700 North Southport Ave., Chicago 14, Ill. Research Div., 8100 Monticello Drive, Skokie, Ill.
Electrical control devices, metal bellows, vapor meters & telephone protective & distributing apparatus, aircraft instrumentation, relays, pressure switches

Cook Research Laboratories, L. H., Box 696, Menlo Park, California
Precision testing instruments for oil industry, oil well cement testing equipment, combustible gas indicators, depth pressure recorders

Cooper-Hewitt Electric Co., 720-732 Grand St., Hoboken, N. J.
Ultraviolet and monochromatic light sources; quartz components; optical components

Cope, Inc., T. J., 711 So. 50th St., Philadelphia 43, Pa.
Instrument tubing support system; instrument tubing

Copes Vulcan Div., Continental Foundry & Machine Co., Erie 4, Pa.
Automatic controllers for boilers, desuperheaters, pumps, etc.; control valves

Coors Porcelain Co., Golden, Colo.
Chemical & scientific porcelain

F. W. Corbett Science Labs., 3115 Venice Blvd., Los Angeles 19, Calif.
Computers; radioactivity instrumentation; oscillographs; electronic instruments and components

Corbin Screw Div., American Hardware Corp., New Britain, Conn.
Tachometers & speedometers

Cornell-Dubilier Electric Corp., 333 Hamilton Blvd., So. Plainfield, New Jersey
Mica, dykanol, paper & wet & dry electrolytic capacitors

Corning Glass Works, P.O. Box 544, Corning, N. Y.
Technical glassware

Cosa Corporation, 405 Lexington Ave., New York 17, N. Y.
Dynamometers; gas density meters; balancing machines; components

Coulter Electronics, 3023 W. Fulton Blvd., Chicago 12, Ill.
Amplifiers, microscopic particle and cell counters

Counter and Control Corp., 5225 W. Electric Ave., Milwaukee 14, Wis.
Circuit-control pre-set counters with automatic reset
(See advertisement on page 107)

Couse & Bolten Co., 41 Lafayette St., Newark 2, N. J.
Plastic tubing; tube fittings

Cramer Co., Inc., R. W., Centerbrook, Conn.
Interval timers, running time meters, time switches, signal control switches, time delay switches

Crane Co., see Hydro Aire

Crane Packing Co., 1800 Cuyler Ave., Chicago 13, Ill.
Optical flats; monochromatic light sources

Crawford Fitting Co., 884 E. 140 St., Cleveland 10, Ohio
Tubing and fittings
(See advertisement on page 139)

Crescent Insulated Wire & Cable Co., 502 Taylor St., Trenton 5, N. J.
Single and "cabled" air and hydraulic tubing

Crosby Steam Gage & Valve Co., 43 Kendrick St., Wrentham, Mass.
Safety & relief valves, gages, recorders, testers & steam engine indicators

Crown Industrial Products Co., 400 Borden Ave., Sycamore, Ill.

Crucible Steel Co. of America, Box 88, Pittsburgh 30, Pa.
Non-corrosive tubing; permanent magnets

Crystal Glass Tube and Cylinder Co., 7318 So. Chicago Ave., Chicago 19, Ill.
Heat resisting, precision hose and other forms of tubing
(See advertisement on page 132)

Crystal Research Labs., Inc., 29 Allyn St., Hartford 3, Conn.
Capacitors, quartz products, filters, flats, frequency meters, signal generators, mirrors, oscillators, r-f. oscillators, vitreous silica, time interval apparatus, vibration pickups

Cuno Engineering Co., 80 So. Vine St., Meriden, Conn.
Filters for air, gases and liquids

Curtin & Co., W. H., P. O. Box 118, Houston, Tex.
Laboratory supplies

Curtis Development & Mfg. Co., 3242 North 33rd St., Milwaukee 16, Wis.
Thermostats

Curtis Labs., 2718 Griffith Park Blvd., Los Angeles 27, Calif.
Optical instruments and components; color separation cameras

Curtiss-Wright Corp., Electronics Div., 631 Central Ave., Carlstadt, N. J.

Custom Lubricant Company, 743 Dwight Way, Berkeley 10, Calif.
Instrument lubricants; special oils

Custom Scientific Instruments, Inc., 541 Devon Street, Kearny, N. J.
Testing machines for flooring, textiles, etc.; microtomes; extensometers; thickness gages

Cuthbert Co., Inc., 302 So. 4th Ave., Minneapolis 15, Minn.
Scientific grain, seed and food testing equipment

Cutler-Hammer, Inc., P.O. Box 463-464, Milwaukee 1, Wis.
Electric motor control, safety switches, motor driven valve operators, gas calorimeters, gas mixing & stabilizing control, resistors

Cybertronic Corp. of America, 3rd & Morton Aves., Chester, Pa.
Automatic controls systems and components

Cyclohm Div., Howard Industries, 1760 State St., Racine, Wis.
Fractional-horsepower motors

Cyclotron Specialties Co., Moraga 6, Calif.
Radioactivity equipment

D

Daco Machine & Tool Co., 202 Tillary St., Brooklyn, N. Y.
Aviation and military instruments

Dage Electric Co., Inc., 67 N. 2nd Street, Beech Grove, Ind.
Accelerometers; connectors

Dage Television Div., Thompson Prod. Co., W. 10th St., Michigan City, Ind.
TV cameras; components

Dahl Co. Inc., George W., 430 High St., Bristol, R. I.
Process, Aircraft and Marine Controls
(See advertisement on page 232)

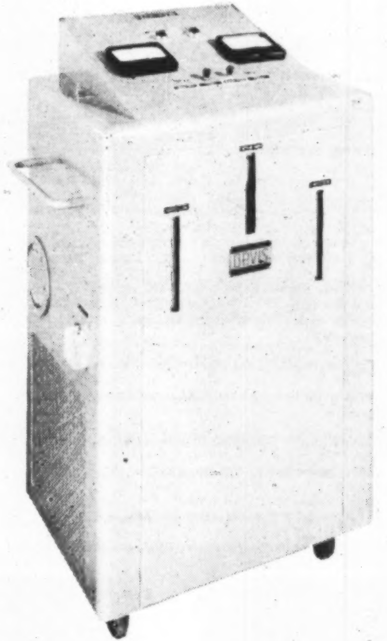
Daigger & Co., A., 159 W. Kinzie St., Chicago 10, Ill.
Laboratory supplies

Dale Instruments Div., Electronic Development Co., 2002 N. 51st St., Omaha 4, Neb.
Electrical instruments

Dale Products, Inc., Box 326, Columbus, Nebr.
Standard resistors; production resistors

Dalmotor Co., 1375 Clay St., Santa Clara, Calif.
Motors; servomotors

Danco Instruments, Inc., 195 West Hills Road., Huntington Station, N. Y.
Operation recorders



GAS ANALYZERS AND GAS ALARM SYSTEMS

for

1. COMBUSTIBLE GASES AND VAPORS
2. TOXIC GASES IN LOW CONCENTRATIONS
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Thermal Conductivity

INSTRUMENT DAVIS DIVISION

DAVIS INSTRUMENTS
A Division of Davis Emergency Equipment Co., Inc.
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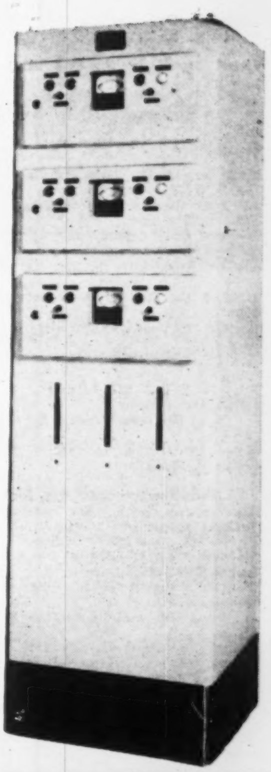
For more information circle **406** on inquiry card.



Daniel Orifice Fitting Co., Inc., 3352 Union Pacific Ave., Los Angeles 23, Calif.
Orifice flowmeters and fittings
(See advertisement on page 162)

Darley & Co., W. S., 2810 Washington Blvd., Chicago 12, Ill.
Pipe locaters

Datran Engineering Corp., 3613 Aviation Blvd., Manhattan Beach, Calif.
Aircraft and industrial-process instrumentation; telemetering systems

Daven Co., 191 Central Ave., Newark 4, N. J.
Attenuators, calibrating equipment for electrical instruments & resistors

Davidson Associates, 730 Fifth Ave., New York 19, N. Y.
Centrifuges, balances, laboratory apparatus

Davidson Mfg. Co., 2223 Ramona Blvd., W. Covina, Calif.
Astronomical telescopes

Davies Labs., Inc., 4705 Queensbury Rd., Riverdale, Md.
Analog simulators and computers; magnetic data recording and playback equipment

Davis Instruments Div., Davis Emergency Equipment Co., Inc., 47 Halleck St., Newark 4, N. J.
Gas analyzers
(See advertisement on page 251)

Davis Regulator Co., 2541 So. Washtenaw Ave., Chicago 8, Ill.
Valves

Daystrom Instrument Div., Daystrom, Inc., Archbald, Pa.

Daytronic Corp., 216 South Main St., Dayton 2, Ohio
Industrial-process and dimensional control systems and components; scales; testing equipment

Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
Chromium plated gage blocks

Dearborn Scientific Co., 1228 W. Kinzie St., Chicago 22, Ill.
Optical flats

Decker Aviation Corp., Research & Dev., 1361 Frankford Ave., Philadelphia 25, Pa.
Dimensional, electrical and radar instrumentation

De Jur-Amsco Corp., Northern Blvd. at 45th St., Long Island City 1, N. Y.
Photoelectric exposure meters, electrical, radio & photographic products

Del Electronics Co., 41 N. McQuesten Pkwy., Mt. Vernon, N. Y.
Electrical and electronic testing instruments; power supplies; transformers

Delmhorst Instrument Co., Cedar St., Boonton, N. J.
Moisture detectors

Deltron, Inc., 2905 N. Leithgow St., Phila., Pa.
Electrical and electronic instruments; titration apparatus; relays

Deltron, Inc., P.O. Box 192, Glenside, Pa.

Deltronic Corp., 1507 Riverside Drive, Los Angeles 31, Calif.
Relays; dimensional gages

Deming Indicator Co., 1016 Acorn Dr., Dayton 9, Ohio
Test indicators & dial indicators

DeMornay-Bonardi, Inc., 3223 Burton Ave., Burbank, Calif.
Electrical and electronic instruments; microwave equipment and testers

Denison Engineering Co., 1160 Dublin Rd., Columbus, Ohio
Presses and controls

R. B. Denison Mfg. Co., 102 St. Clair Ave. N.W., Cleveland 13, Ohio
Switches

Denver Fire Clay Co., P. O. Box 5510, Denver 17, Col.
Specialized industrial control equipment for power plant & processing industries, laboratory specialties

Derbyshire, Inc., F. W., 157 High St., Waltham 54, Mass.
Instrument lathes; micromills; chucks, etc.

Desco Mfg. Co., 605 E. Walnut St., Pasadena 1, Calif.
Electrical inspection and testing equipment

Designers for Industry, 4746 W. Washington Blvd., Los Angeles 16, Calif.
Pressure, vacuum and level gages

Detect-O-Ray, 2622 N. Halsted St., Chicago 14, Ill.
Photoelectric counters

Detecto Scales, Inc., 540 Park Ave., Brooklyn 5, N. Y.
Scales

Detectolab, Inc., 6544 Sheridan Rd., Chicago 26, Ill.
Radioactivity instrumentation; amplifiers; counters

Detectron Co., 5528 Vineland Ave., North Hollywood, Calif.
Leak and pipe detectors, radiation counters

De-Tec-Tronic Corporation, 2512 N. Halsted Street, Chicago 14, Ill.
Photoelectric instruments

Detroit Testing Machine Co., 9390 Grinnell Ave., Detroit 13, Mich.
Testing machines

Development Engineering Co., 9 Cross St., Norwalk, Conn.
Automatic assembly machines
(See advertisement on page 92)

Development Industries, Box 7053, Cranwood Sta., Cleveland 28, Ohio
Differential-pressure gages

Devtronics, Inc., 221 N. Hermitage Ave., Trenton 8, N. J.

Dexter Machine Products, Inc., Box 328, Chelsea, Mich.
Instrument Gears

DeZurik Shower Co., Sartell, Minn.
Consistency regulators; weir-type flowmeters; control valves

Dialight Corp., 60 Stewart Ave., Brooklyn 37, N. Y.
Dial lights
(See advertisement on page 171)

Diamond Power Specialty Corp., P. O. Box 415, Lancaster, Ohio
Industrial television

Diatron Co., 5411 Pocahontas, Bellaire, Texas
Electrical and electronic instruments

Dice Co., J. W., 1 Engle St., Englewood, N. J.
Gages, electrical instruments, non destructive inspection and testing equipment

Dickson Co., 7420 Woodlawn Ave., Chicago 19, Ill.
Furnace controls

Diehl Mfg. Co., Finderne Plant, 1116 Finderne Ave., Somerville, N. J.

Dietert Co., Harry W., 9330 Roselawn Ave., Detroit 4, Mich.
Sand testing equipment; immersion pyrometers, moisture testers, accessories for spectrographic laboratories
(See advertisement on page 216)

Dietz Co., H. G., 12-16 Astoria Blvd., Long Island City 2, N. Y.
Automatic timers; panels; switchgear

Dietzgen Co., Eugene, 2425 North Sheffield Ave., Chicago 14, Ill.
Drafting & surveying instruments

Dillon & Co., W. C., 14620 Keswick St., Van Nuys, Calif.
Traction dynamometers, tensile machines, thermometers
(See advertisement on page 114)

Dimco-Gray Co., 207 E. 6 St., Dayton 2, Ohio
Timers and switches
(See advertisement on page 224)

Dirigo Compass & Instrument Co., Boeing Field, Seattle 8, Wash.

Distillation Products Industries, Rochester 3, N. Y.
High vacuum pumps, low vapor pressure fluids & auxiliary equipment

Dit-Mco Inc., Electronics Div., 505 W. 9th St., Kansas City, Mo.
Electrical and electronic inspection and testing systems; components
(See advertisement on page 38)

Dittmore & Freimuth Co., 2517 E. Norwich Ave., Cudahy, Wis.
Electrical instruments, counters

Dixon, William, Inc., 32-42 E. Kinney St., Newark 1, N. J.
Optical and mechanical micrometers; jeweler's balances and tools

DoAll Company, 254 N. Laurel, Des Plaines, Ill.
Gages, Brinnell hardness testers, precision tools

Doelcam Div., Minneapolis-Honeywell Regulator Co., 1400 Soldiers Field Rd., Boston 35, Mass.
Precision instruments, gyroscopics, servomechanisms

Doerr Glass Co., Inc., N.E. Cor. Peach & Blvd., Vineland, N. J.
Chemical glassware

Dollinger Corp., 11 Centre Park, Rochester 3, N. Y.
Instrument air filters

Dommers Co., The, 428 S. Cherry St., Wallingford, Conn.
Testing machines

Donner Scientific Co., 2829 Seventh St., Berkeley 10, Calif.
Electrical instruments and automatic-control systems; aircraft instruments

Doolittle Radio, Inc., 7421 Loomis Blvd., Chicago 36, Ill.
Frequency monitor

Dorber Co., 7741 W. Palatine Ave., Chicago 31, Ill.
Dissolved oxygen analyzer

Dormitzer Elec. & Mfg. Co., Inc., 50 Hadley St., Cambridge, Mass.
Electrical instruments; speed control systems; light sources; relays; intercoms; electronic components

Dorr-Patterson Engineering Co., 241 Chene, Detroit 7, Mich.
Physical testing machines

Douglas Instrument Labs., 176 Norfolk Ave., Boston 19, Mass.
Electrical and electronic instruments

Douglass Automatic Controls Co., 5949 Clara St., Bell Gardens, Calif.
Boiler controls

Douthitt Corp., 650 W. Baltimore Ave., Detroit 2, Mich.
Process cameras & diaphragm control for cameras

Dow Corning Corp., P. O. Box 592, Midland, Mich.
Silicone fluids and greases for high and low temperature lubrication of instruments, stop-cock grease, high vacuum grease, lens cement, liquid dielectrics, diffusion pump oils

D & R Limited, 402 Gutierrez St., Santa Barbara, Calif.
Electronic instruments

Drafte Co., Cochranton, Pa.
Drafting machines

Drage Products, 406-32nd St., Union City, N. J.
Viscosity measurement and automatic-control equipment; cryptometers; laboratory baths
(See advertisement on page 235)

Dragon Engineering Co., 5817 S. Central Ave., Los Angeles 11, Calif.
High pressure needle valves, regular & panel mounted
(See advertisement on page 232)

Drake Manufacturing Co., 1713 W. Hubbard St., Chicago 22, Ill.
Dial & signal lights
(See advertisement on page 170)

Draper Mfg. Co., 45 Warren St., New York 7, N. Y.
Temperature and humidity instrumentation

Dressen-Barnes Corp., 250 N. Vinedo Ave., Pasadena 8, Calif.
Automatic control systems and components

Driaire, Inc., 132 S. Main St., South Norwalk, Conn.
Humidity and dehydration instruments and specialties

Du-Co Ceramics Co., Box 587, Butler, Pa.
Pyrometer tubes; insulators; ceramic materials

Ducommun Co., M., 580 Fifth Ave., New York, 36, N. Y.
Coil-spring stopwatches

Du Mont Labs., Inc., Allen B., Inst. Div., 760 Bloomfield Ave., Clifton, N. J.
Cathode-ray oscillographs, cathode-ray tubes, associated electronic equipment, television control, studio & transmitting equipment

Duncan Electric Mfg. Co., Lafayette, Ind.
A-c. & d-c. watthour meters, service & switchboard types; portable test meters, appliance meters & instrument transformers

Dunlee Corp., 4558 W. Congress St., Chicago 24, Ill.
X-ray tubes

DuPont de Nemours & Co., E. I., N. W. Corner 10th & Market Sts., Wilmington 98, Del.
Fluorescent screens and chemicals

Durakool Inc., 1010 N. Main St., Elkhart, Ind.
Mercury switches

Durant Manufacturing Co., 1925-1929 N. Buffum St., Milwaukee 1, Wis.
Counting & measuring machines

Dusenbery, John, 150 Pine St., Montclair, N. J.
Designers and builders of nautical instruments and special mechanical devices

Dwyer Mfg. Co., F. W., 317 S. Western Ave., Chicago 12, Ill.
Portable & stationary draft gages, CO_2 indicators & combustion testing sets
(See advertisements on pages 125, 143)

Dyna-Labs, Inc., 1075 Stewart Ave., Garden City, L. I., N. Y.
Testers; noise analyzers; electrical instruments; transformers; thermocouples

Dynalysis Developmental Labs, Inc., 11941 Wilshire Blvd., Los Angeles 25, Calif.
Analog computers; custom control systems

Dynamatic Div., Eaton Mfg. Co., 3307 14th Ave., Kenosha, Wis.
Variable speed drives, torque measuring equipment

Dynamic Instrument Co., 28 Carleton St., Cambridge 42, Mass.
Pressure, force, load and strain instrumentation

E

Eagle Signal Corp., 202 20th St., Moline, Ill.
Industrial control devices, traffic signal controllers & sign flashers

Eastern Air Devices, Inc., 385 Central Ave., Dover, N. Hampshire
Fraction-hp motors; synchronous motors

Eastern Industries, Inc., 100 Skiff St., Hamden 14, Conn.
Laboratory pumps, stirrers & thermoregulators

Eastern Precision Resistor Corp., 130-11 90th Ave., Richmond Hill 18, N. Y.
Decade boxes; heat flow instrumentation

Eastern Science Supply Co., 7-9 High St., Brookline, Mass.
Meteorological instruments

Eastern Specialty Co., 3617 N. 8th St., Philadelphia 40, Pa.
Testing equipment for checking & maintenance of all types of electricity meters such as watthour meters, demand instruments, etc. Special apparatus for load survey work.
(See advertisement on page 219)

Eastman Kodak Co., 343 State St., Rochester 4, N. Y.
Photographic equipment for laboratories, spectrographic, X-ray, etc.

Eastman Oil Well Survey Co., P. O. Box 408, Long Beach 1, Calif.
Underground surveying equipment

Eaton-Dikeman Co., Mt. Holly Springs, Pa.
Laboratory apparatus

Eberbach Corp., 200-208 E. Liberty St., Ann Arbor, Mich.
Laboratory apparatus

Ebert Electronics Co., 212-26 Jamaica Ave., Queens Village 28, N. Y.

Eby, Inc., Hugh H., 4700 Stenton Ave., Philadelphia 44, Pa.
Relays & radio parts

E-C Apparatus Co., 23 Haven Ave., New York 32, N. Y.
Electroconvection apparatus; countercurrent extractors; electrophoresis paper; power supplies

Eck & Krebs, 2709 40th Ave., Long Island City, N. Y.

Eckert-Mauchly Div. Remington Rand Inc., 2300 W. Allegheny Ave., Philadelphia 23, Pa.
Computers

Eclipse Fuel Engg. Co., 1100 Buchanan St., Rockford, Ill.
Furnaces, boilers and their automatic controls; valves; accessories

Eclipse-Pioneer Div., See Bendix Aviation Corp.

Edcliff Instruments, 383 N. Foothill Blvd., Pasadena 8, Calif.
Potentiometers
(See advertisement on page 174)

Eder Instrument Co., 2293 N. Clybourn Ave., Chicago 14, Ill.
Pocket microscope
(See advertisement on page 137)

Edelmann & Co., E., 2332 Logan Blvd., Chicago 47, Ill.
Automotive test instruments

Edgerton, Germeshausen & Grier, Inc., 160 Brookline Ave., Boston 15, Mass.
Research-type cameras; xenon discharge tubes; oceanographic instruments

Edin Co., 207 Main St., Worcester 8, Mass.
Oscillographs and oscilloscopes

Edison, Inc., Thomas A., Instrument Div., West Orange, N. J.
Sealed-in-glass control devices, including thermostatic switches, fire detection thermostats, & timing relays. Hermetically sealed thermostatic valves. Special control equipment
(See advertisement on page 77)

Edmund Scientific Corp., 508 E. Gloucester Pike, Barrington, N. J.
Telescopes; microscopes; spectroscopes; optical components

Edwards, L. V., 32 Irving Place, Rockville Centre, N. Y.
Smoke-density instruments and alarms

Edward Valves, Inc., 1200 W. 145th St., E. Chicago, Ind.
Control valves

EECO Production Co., 827 Vermont Ave., Los Angeles 5, Calif.
Electrical and electronic instruments
(See advertisement on page 170)

L. C. Eichner Instruments, 19 Sebago St., Clifton, N. J.

Eicor, Inc., 1501 W. Congress St., Chicago 7, Ill.
Fractional H. P., geared, ungeared, synchronous, capacitor, and D. C. motors

Eitel-McCullough, Inc., San Bruno, Calif.
Electrical and electronic instruments and components

Eitzen Co., Louis C., 17 W. 60th St., New York 23, N. Y.
Extensometers

Elastic Stop Nut Corp. of America, AGA Div., 1029 Newark Ave., Elizabeth, N. J.
Time-delay relays
(See advertisement on page 193)

Electomic Designs, P. O. Box 1156, Greenwich, Conn.
Electromechanical amplifiers; servomotors

Electric Auto-Lite Co., Instrument & Gauge Div., Toledo 1, Ohio
Pressure & vacuum gages, speedometers, tachometers & thermometers

Electric Controls, Inc., Swan Island, Portland, Oregon
Load regulators; thermostats

Electric Design & Mfg. Co., Burlington, Iowa
Electrical instruments

Electric Eye Equipment Co., 1938 E. Fairchild St., Danville, Ill.
Automatic inspection devices

Elec. Heat Control Apparatus Co., 507 Fifth Ave., Room 1066, New York 17, N. Y.
Laboratory ovens

Electric Hotpack Co. Inc., Melrose St. at Cottman Ave., Philadelphia 35, Pa.
Designers and manufacturers of heat control and laboratory equipment
(See advertisement on page 140)

Electric Indicator Co., Camp Ave., Springdale, Conn.
Synchronous motors, position indicators, level controls, signaling devices

Electric Regulator Corp., Pearl St., Norwalk, Conn.
Current and frequency regulators

Electric Soldering Iron Co., Deep River, Conn.
Soldering irons

Electric Sorting Machine Co., 410-44th St. S. W., Grand Rapids 8, Mich.
Photoelectric equipment; automatic inspection equipment

Electric Speed Indicator Co., 12234 Triskett Road, Cleveland 11, Ohio
Precision electric tachometers & remote position indicators

Electric Tachometer Corp., 2218 Vine St., Philadelphia 3, Pa.
Speed indicators & recorders, electric & mechanical counters

Electrical Development Co., 40 East 40th St., New York 16, N. Y.
Electrical instruments, computers, components

Electrical Facilities Inc., 4224 Holden St., Oakland 8, Calif.
Apparatus for electrical measuring & testing, including precision transformers, watthour meter and instrument transformer testing equipment; rectifier apparatus

Electrical and Physical Instrument Corp., 25 W. 43rd St., New York 36, N. Y.
Electronic instruments

Electrical Utilities Co., 2429 St. Vincent Ave., La Salle, Ill.

Electrimatic Div., Marsh Corp., J. P., 3501 Howard St., Skokie, Ill.
Automatic control valves & controls, regulating valves
Pressure, temperature & electrical actuation

Electro-Data Corp., 717 N. Lake Ave., Pasadena, Calif.

Electro Development Co., 14701 Keswick St., Van Nuys, Calif.
Miniature Slip rings

Electro Devices, Inc., 4025 Easton Ave., St. Louis 13, Mo.
Electrical and electronic instruments
(See advertisement on page 75)

Electro Engineering Products Co., 609 West Lake St., Chicago 6, Ill.
Instrument and servomechanism motors; signal generators, HF apparatus

Electro Instruments, 3796 Rosecrans St., San Diego, Calif.
Digital instruments and readouts

Electro-Measurements, Inc., 4312 SE Stark Ave., Portland, Oregon
Electrical and electronic instruments; components.

Electro-Mec Laboratory, 21-09 43rd Ave., Long Island City, N. Y.
Electrical and electronic components

Electro-Mechanical Instrument Co., 812 Chestnut St., Perkasie, Pa.
Electrical instruments

Electro-Mechanical Research, Inc., 64 Main St., Ridgefield, Conn.
Electrical and electronic instruments and components

Electro Mechano Co., 261 E. Erie St., Milwaukee 2, Wis.
Tachometers, precision drill press

Electro-Medical Laboratory, Inc., South Woodstock, Vt.
Neurological & Allied medical instruments & general electronic apparatus
(See advertisement on page 96)

Electro-Physics Co., 287 Broadway, New York 7, N. Y.
Electronic and photoelectric instruments; viscosimeters; relays

Electro Products Laboratories, Inc., 4501 N. Ravenswood Ave., Chicago 40, Ill.
Battery eliminators & rectified A. C. devices
(See advertisement on page 169)

Electro Pulse, Inc., 11811 Major St., Culver City, Calif.
Electrical and electronic instruments

Electro-Snap Switch and Mfg. Co., 4222 W. Lake St., Chicago 24, Ill.
Switches

Electro Switch Corp., 167 King Ave., Weymouth 88, Mass.
Switches

Electro-Tech Equipment Co., 308 Canal St., New York 13, N. Y.
Electrical and electronic parts & equipment distributor

Electro-Voice, Inc., Buchanan, Mich.
Microphonic equipment

Electrocon Corp., 219 Sunrise Highway West, Freeport, N. Y.
Vibration measuring instruments

Electromec Inc., 3200 N. San Fernando Blvd., Burbank, Calif.
Data processing equipment; supervisory control systems

Electronic Apparatus Corp., 116 E. Jackson Blvd., Elkhart, Ind.
Mercury relays and switches

Electronic Associates, Inc., Long Branch Ave., Long Branch, N. J.
Aircraft and electrical instruments

Electronic Computer Div., Underwood Corp., 35-10—36th Ave., Long Island City 6, N. Y.

Electronic Control Corporation, 1573 E. Forest Ave., Detroit 7, Mich.
Automatic controllers and timers; relays; photoelectric instruments; amplifiers; thickness gages

Electronic Control Systems, Inc., 2138 Westwood Blvd., Los Angeles, Calif.
Automatic and remote control systems.

Electronic Controls, Inc., 4521 Chestnut St., Philadelphia 39, Pa.
Electronic controllers and timers for counting, lighting, etc.

Electronic Designs, Inc., 28 School St., Yonkers, N. Y.
Vacuum-tube voltmeters

Electronic Development Co., See Dale Instruments Div.

Electronic Development Lab., 2655 W. 19th St., Chicago 8, Ill.
Electronic apparatus

Electronic Engineering Associates, Ltd., 1040 Brittan Ave., San Carlos, Calif.
Dynamic pressure measuring equipment
(See advertisement on page 180)

Electronic Engineering & Services Co., Inc., 104 W. Jefferson St., Falls Church, Va.

Electronic Fabricators, Inc., 682 Broadway, New York City, N. Y.

Electronic Instrument Co., 84 Withers St., Brooklyn 11, N. Y.
Electrical and electronic instruments

Electronic Mfg. Co., 140 S. Second St., Harrisburg, Pa.
Oscillators, voltmeters

Electronic Measurements Co., Inc., Lewis St. & Maple Ave., Eatontown, N. J.
Electronic instruments; power supplies

Electronic Measurements Corp., 280 Lafayette St., New York 3, N. Y.
Oscilloscopes; tube testers; radio and TV set analyzers; volt-ohm-milliammeters

Electronic Products Co., 111 Third St., Mt. Vernon, N. Y.
Electrical and electronic instruments.

Electronic Products Co., 5330 E. Olympic Blvd., Los Angeles 22, Calif.
Glass instruments & apparatus

Electronic Rectifiers, Inc., 2102 Spann Ave., Indianapolis 3, Ind.
Laboratory and industrial power supplies; rectifiers

Electronic Research Associates, Box 29, Caldwell, N. J.
Electrical instrumentation; transistor circuits; power supplies

Electronic Transformer Co., Inc., 207 W. 25th St., New York 1, N. Y.
Fixed and adjustable transformers

Electronic Tube Corp., 1200 E. Mermaid Lane, Philadelphia, Pa.
Cathode ray oscilligraphs

Electronics Corp. of America, 77 Broadway, Cambridge 42, Mass.
Industrial photoelectric controls including counting equipment; electronic timers & special electronic controls; smoke controls

Electron-Radar Prods., 4806 W. Chicago Ave., Chicago 44, Ill.
Vacuum gages; photocells and phototubes; watthour meter testers; alarm systems; bridges; components

Electrons, Inc., 127 Sussex Ave., Newark 3, N. J.
Gas-filled & grid-control rectifier tubes

Electrosig Corp., 4536 Main St., Buffalo 21, N. Y.
Voltage regulators; automatic timers; transformers; rectifiers; laboratory apparatus; electroplating solution testers

Electyme Motor Products Corp., River Woods Rd., Deerfield, Ill.
Clocks and timers

Elektro-Serv. Co., 480 Johnson Ave., Brooklyn 37, N. Y.
Electrical components.

Elematic Equipment Corp., 6731 So. Chicago Ave., Chicago 37, Ill.
Pyrometers

Elgin National Watch Co., Elgin, Ill., Industrial Products Div., Elgin, Ill.
Watches, clocks, gages, gaging fixtures and micrometers

Elgin-Neomatic, Inc., 9010 Bellanca Ave., Los Angeles 45, Calif.
Master clocks, relays, switches
(See advertisement on page 193)

Ellis Associates, Box 77, Pelham 65, N. Y.
Preamplifiers; strain-time recorders; calibrating equipment

Ellis & Sons Inc., G. D., American & Luzerne Sts., Philadelphia 40, Pa.
Instrument packaging

Ellison Draft Gage Co., 548 W. Monroe St., Chicago 6, Ill.
Manometers, draft gages, orsats
(See advertisement on page 124)

El Mec Labs., 730 Boulevard, Kenilworth, N. J.

El-Tronics, Inc., 437 North 5th St., Philadelphia 6, Pa.
Nuclear and electronic instrumentation; radioactivity standards and supplies

Emarco Corp., P. O. Box 615, Far Hills Sta., Dayton 9, Ohio.
Signalling system and components.

Emerson Apparatus Co., 171 Tremont St., Melrose, Mass.
Calorimeters

Emery Company, A. H., Pine St., New Canaan, Conn.
Pressure gages and testing machines
(See advertisement on page 210)

Emmett Machine & Mfg. Co., 445 E. Turkeyfoot Lake Rd., Akron 19, Ohio
Automatic controllers, timer and control valves

Empire Devices, Inc., 38-25 Bell Blvd., Bayside, N. Y.
High frequency apparatus

Empire State Labs., 2608 Merrick Rd., Bellmore, L. I., N. Y.
Precision gear and instrument assemblies and mechanical components.
(See advertisement on page 83)

Endevco Corp., 689 So. Fair Oaks Ave., Pasadena 2, Calif.
Industrial measurement and control instruments

Engel, Inc., H. C. M., P. O. Box 233, Sidney, N. Y.
Small drills, small turned parts, millstones in sapphire and block grinding discs

Engelhard, Inc., Charles, 850 Passaic Ave., East Newark, N. J.
Industrial instruments

Engineered Magnetics, 11812 Teale St., Culver City, Calif.
Power supplies; regulators

Engineering Laboratiories, Inc., 610-24 E. 4th St., Tulsa 3, Okla.
Seismic exploration equipment, vibration detectors petroleum engineering devices, signaling equipment

Engineering & Research Corp., Div. of ACF Industries, Inc., P. O. Box 209, Hyattsville, Md.

Engineering Research & Development Co., Addison, Ill.
Precision instruments custom built

Engineering Research Associates, Inc., 1902 West Minnehaha Ave., St. Paul 4, Minn.

Engineers Specialty Div., Universal Engraving & Colorplate Co., 980 Elliott St., Buffalo 9, N. Y.
Optical comparators

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Microscopes, surveying instruments, photoelectric color analyzers, optical flats and components

Engler Instrument Co., 250 Culver Ave., Jersey City 5, N. J.
Time registers, controllers and recorders; hub odometors; airspeed indicators

Environmental Equipment Corp., 369 Linden St., Brooklyn, N. Y.
Testing equipment
(See advertisement on page 92)

Epic, Inc., 154 Nassau St., New York 38, N. Y.
Electrical and electronic instruments.

Eppley Laboratory Inc., 12 Sheffield Ave., Newport, R. I.
Thermopiles, pyrheliometers & standard cells for both industrial & laboratory use
(See advertisement inside front cover, 91)

Epsco, Inc., 588 Commonwealth Ave., Boston 15, Mass.
Electrical and electronic instruments; flight test instruments; digital computing equipment.

Erb & Gray, 854 S. Figueroa St., Los Angeles 17, Calif.
Optical, mechanical and electrical instruments

Erdco Engineering Corp., Addison, Ill.
Electromagnetic flowmeters; electrical and electronic instruments; components.

Ercona Corp., 527 5th Ave., New York 17, N. Y.
Mechanical and optical toolroom and gage-lab equipment

Erickson Specialty Co., 10 Cayuga St., P. O. Box 141, Cohoes, N. Y.
Solenoid valves

Erie Resistor Corp., 644 West 12th St., Erie, Pa.
High frequency & molded resistors

Eriez Mfg. Co., 420 Commerce Bldg., Erie, Pa.
Permanent magnets

Erwood, Inc., 1770 Berteau St., Chicago 13, Ill.
Sound and vibration instrumentation

E & S Optical Co., 1426-28 Willow Ave., Hoboken, N. J.
Optical components
(See advertisement on page 161)

E S C Corporation, 534 Bergen Blvd., Palisades Park, N. J.
Delay lines; pulse transformers; radio noise filters

Esco Products Co., (see E & S Optical Co.)
Dimensional gages and inspection equipment; optical instruments and components; light sources.

Ess Instrument Co., 96 S. Washington Ave., Bergenfield, N. J.
Industrial electronic instruments, photoelectric for smoke, flame, turbidity, color. Specific gravity indicators, recorders and controllers

Essex Wire Corp., R-B-M Div., Logansport, Ind.
Electronic and electromagnetic relays

Esterline-Angus Co., Inc., P. O. Box 596, Indianapolis 6, Ind.
Graphic recording & contact-making electrical instruments, time, speed, condensate purity, pressure & vacuum recorders, telemeters & portable current transformers

E-T-A Products Co., 5506 N. Bernard St., Chicago 25, Ill.
Relays; testing equipment for circuit breakers and relays; motor controllers

Eureka X-ray Tube Corp., 3240-58 N. Kilpatrick Ave., Chicago 41, Ill.
X-ray tubes

Evaporated Metal Films Co., Ithaca, N. Y.

Ever Ready Thermometer Co., 88 Park Pl., New York 7, N. Y.
Calorimeters, thermometers

Everson Mfg. Co., 214 W. Huron St., Chicago 10, Ill.
Chemical feeders

E & W Optical Co., 2406 E. Hennepin Ave., Minneapolis 14, Minn.
Dimensional gaging equipment; optical instr's and components

Exact Weight Scale Co., 944 West 5th Ave., Columbus 8, Ohio
Over-and-under weight scales & indicators for industrial purposes

F

Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill. Electronics Div., 2212 E. 12th St., Davenport, Iowa
Scales

Fairchild Camera & Inst. Corp., Robbins Lane, Syosset, N. Y.
Instrument motors, servo-motors, navigational instruments, oscilloscope- and X-ray recording cameras

Fairchild Camera & Inst. Corp., Potentiometer Div., 225 Park Ave. Hicksville L. I., N. Y.
Photographic equipment

Fairchild Industries Div., Burlington, Vt.
Fractional-hp. motors

Fairchild Recording Equipment Corp., 154 St. & 7th Ave., Whitestone, N. Y.
Magnetic tape recorder

Falstrom Co., 92 Falstrom Ct., Passaic, N. J.
Steel instrument panels, panel board assemblies, cubicles, totally enclosed weather & vermin proof instrument enclosures & steel cabinets
(See advertisement on page 21)

Fansteel Metallurgical Corp., 2200 Sheridan Rd., North Chicago, Ill.
Rectifiers; special alloys

Farmer Electric Co., 21 Mossfield Rd., Waban 68, Mass.
Automatic timers; relays; switches

Farnsworth Electronics Co., Fort Wayne 1, Ind.
Industrial television systems

Farrand Optical Co., Inc., Bronx Blvd. and E. 238 St., New York 70, N. Y.
Scientific instruments

Farris Engineering Corp., 400 Commercial Ave., Palisades Park, N. J.
Safety and relief valves, naval and aircraft regulators; and hydraulic remote controls

Farris Flexible Valve Corp., 436 Commercial Ave., Palisades Park, N. J.
Manually and automatically operated valves

Farris Pickering Governor Co., 400 Commercial Ave., Palisades Park, N. J.
Speed regulators; pump controllers; control valves

Farris-Stacon Corp., 345 Commercial Ave., Palisades Park, N. J.
Automatic controllers, valves

Fasco Industries, Inc., P. O. Box 509, Rochester 2, N. Y.
Fractional-hp. motors

Fassett Co., Inc., C. M., 21 W. Main Ave., Spokane, 8, Wash.
Laboratory supplies

Fecker, J. W., Inc., 2016 Perrysville Ave., Pittsburgh 14, Pa.
Astronomical instruments

Federal Anti- Capacity Switch Corp., 1200 Niagara St., Buffalo, N. Y.
Anti-capacity switches

Federal Classifier Systems, Inc., 127 N. Dearborn St., Chicago 2, Ill.
Particle size classifiers

Federal Instrument Co., 14-02 Broadway, Long Island City 2, N. Y.
Resistors

Federal Mfg. & Eng. Corp., 211 Steuben St., Brooklyn 5, N. Y.
Microscopes

Federal Products Corp., 1144 Eddy St., Providence 1, R. I.
Precision measuring instruments
(See advertisement on page 124)

Federal Screw Products Inc., 3917 N. Kedzie Ave., Chicago 18, Ill.
Hardware for instrument manufacturing
(See advertisement on page 133)

Federal Telephone and Radio Corp., 100 Kingsland Road, Clifton, N. J.
Radio transmitting and direction finding equipment. transmitting tubes, field intensity meters

Federal Tool Eng'g. Co., 1384 Pompton Ave., Cedar Grove, N. J.
Welding machines and accessories.
(See advertisement on page 238)

Feedback Controls, Inc., 1332 N. Henry St., Alexandria, Va.
Electrical and electronic instruments; control systems; computers

Feiler Engineering Co., 8026 N. Monticello Ave., Skokie, Ill.
Electrical Instruments

Felts Corp., Microdot Div., 1826 Fremont St., So. Pasadena, Calif.
Cables, connectors and components

Fellows Gear Shaper Co., 78 River Rd., Springfield, Vt.
Gear checking machines & involute measuring machines

Femco, Inc., Box 32, Irwin, Pa.
Plant intercom; audio amplifiers; remote and supervisory control equipment and systems

Fenwal Inc., 3 Main St., Ashland, Mass.
Industrial thermostats

Ferguson Co., 814 Ridgely St., Baltimore 30, Md.
Laboratory supply house

Ferner Co., R. Y., 110 Pleasant St., Malden, Mass.
Precision instruments

Ferrara, Inc., 8106 W. 9 Mile Rd. Oak Park 37, Mich.
Automatic controllers; relays

Ferrier Engineering, 24 Benton St., Springfield, Mass.
Special instruments; test stands for automatic and diesel industries

Ferranti Electric, Inc., 30 Rockefeller Plaza, New York 20, N. Y.
Electrical instruments

Ferris Instrument Corp., Boonton, N. J.
Laboratory & production testing equipment, radio noise & field strength meters & special electrical instruments

Ficklen, Jos. B., 1848 E. Mountain St., Pasadena 7, Calif.
Gas and dust analyzers

Fidelity Machine Co., 3906 Frankfort Ave., Philadelphia, Pa.
Abrasion testers

Field Electrical Instrument Co., 8 North Manheim Blvd., New Paltz, N. Y.
Electrical instruments

Fielden Instrument Div., Robertshaw, Fulton Controls Co., 2900 N. 4th St., Philadelphia 33, Pa.
Automatic controllers, electrical instruments
(See advertisement on page 101)

Film Capacitors, Inc., 337 E. 139 St., New York 54, N. Y.
Fixed and variable capacitors

Finn & Co., Inc., T. R., 200 Central Ave., Hawthorne, N. J.
Shock & vibration control equipment

Fischer & Porter Co., 775 Warminster Rd., Hatboro, Pa.
Rotameters, sight flow meters, automatic flow controllers, precision optical cells, precision bore glass tubing & special precision glass apparatus

Fish-Schurman Corp., 68 Portman Rd., New Rochelle, N. Y.
Scientific instruments, optical, technical & scientific glass & porcelain

Fisher Governor Co., Marshalltown, Iowa
Motor control valves & regulators
(See advertisement on page 11)

Fisher-Pierce Co., 170 Pearl St., South Braintree, Mass.
Photoelectric controls, relays, timers

Fisher Research Laboratory 1961-63-65 University Ave. Palo Alto, Calif.
Leak detector & pipe finder. Electronic equipment

Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa.
Standard & special equipment & instruments for chemical, biological & metallurgical laboratories

Fleischhauer & Son, F., 89-36 187 Place, Hollis, L. I., N. Y.
Instrument makers

Flett Laboratory, 3711 Marshall Rd., Drexel Hill, Pa.
Fade-o-meters; G-M counters; traffic signal equipment

Flexonics Corp., 1315 S. Third Ave., Maywood, Ill.
Hydraulic and pneumatic bellows and tubing

Flight Research Inc., P. O. Box 1-F, Richmond 1, Va.
Servomechanisms and automatic control systems

Flow Corp., 283 Concord Ave., Cambridge 38, Mass.
Flow-rate and pressure instrumentation and components
(See advertisement on page 120)

Fluke Mfg. Co., Inc., John, 1111 W. Nickerson St., Seattle 99, Wash.
Electrical and electronic instruments; power supplies

Fluor Corp., Ltd., Box 7030 East L. A. Branch, Los Angeles 22, Calif.
Pressure snubbers and pulsation dampers

Fonda Gage Corp., 53 Daly St., Stamford, Conn.
Gage blocks

Food Technology, Inc., 5903 NW Highway, Chicago 31, Ill.
Temperature and humidity chambers, testing apparatus

Ford Engineering Co., 129 "A" St., Upland, Calif.
Voltage dividers

Ford Instrument Co., Div. of Sperry Corp., 31-10 Thomson Ave., Long Island City 1, N. Y.
Airborne and ground instruments, automatic controllers, servomechanisms

Forro Scientific Co., 833 Lincoln St., Evanston, Ill.
Laboratory, industrial-process, dimensional and nuclear instrumentation; components

Fosdick Glass Co., 4301 N. Main St., Dayton 5, Ohio
Reflectors; lenses; optical flats; optical components

Foster Engineering Co., 835 Lehigh Ave., Union, N. J.
Control valves
(See advertisement on page 40)

Fox Valley Instrument Co., Route 1, Highway 27, Cheboygan, Mich.
Industrial and automatic service instruments

Foxboro Co., 468 Neponset Avenue, Foxboro, Mass.
Indicating, recording & controlling instruments for pressure, temperature, humidity, level & flow
(See advertisement on page 29)

F-R Machine Works, Inc., 26-12 Borough Pl., Woodside 77, N. Y.

Frangible Discs, Inc., 57 Railroad Ave., Penns Grove, N. J.
Safety discs; fuse plugs

Franklin Electronics Inc., 415 West Pike St., Philadelphia 40, Pa.

Fraser Development Laboratory, P. O. Box 73, Huntington Station, N. Y.
Fluxometer for measuring magnetic flux in gauss

Freas Glass Works, F. L., 140-150 E. 9th Ave., Conshohoken, Pa.
Hydrometers, thermometers & glass instruments

Fredericks Co., George E., Ann St., & Philamont Rd., Bethayres, Pa.
Glass instruments & apparatus

Freed Transformer Company, 1718 Weirfield St., Brooklyn 27, N. Y.
Transformers

Frick Co., Waynesboro, Pa.
Float valve controls & electric controls, refrigerating & air conditioning machinery

Freidrich & Dimmock, Inc., Lincoln Ave., Millville, N. J.
Laboratory apparatus.

Friez Instrument Div., Bendix Aviation Corp., Towson 4 Md.
Temperature & humidity controls, gas & stoker controls, damper motors, electrical relays, temperature & humidity indicators & recorders, psychrometers, draft gages, anemometers, CO_2 analyzers

Frank Fruengel Inc., 2728 Ferncliff Ave., Dayton 10, Ohio
Electrical and electronic test instruments

Fuel Watchman, 77-29 138 St., Flushing, L. I., N. Y.

Fuess, Inc., R., 39 West 60th St., New York 23, N. Y.
Scientific instruments

Fulcrum Oil Company, Franklin, Pa.
Instrument oils

Fuller Co., 110 Bridge St., Catasauqua, Pa.
Bulk material level controllers

Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville 4, Tenn.
Temperature & pressure regulators, sylphon bellows; thermostat assemblies; diesel controls; automobile thermostats; air conditioning controls

Furnas Electric Co., 300 McKee St., Batavia, Ill.
Pressure controls

Furst Electronics, 3322 W. Lawrence Ave., Chicago 25, Ill.
Electronic instruments

G

Gadgets, Inc., 3629 N. Dixie Drive, Dayton 4, Ohio
Airborne and ground instruments, testing chambers

Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill.
Measuring instruments including toolmaker microscopes, micrometer slides, micrometer microscopes, comparators, interferometers, spherometers, microscopes & telescopes for observation & inspection; time recording devices including chronographs & special devices; dividing machines for engraving linear & circular scales; goniometers; spectroscopic equipment & accessories
(See advertisement on page 148)

Gallien, R. P. & Son, 220 W. 5th St., Los Angeles 13, Calif.
Instrument lathes & tools

Gamewell Co., 1238 Chestnut St., Newton Upper Falls 64, Mass.
Voltage dividing resistors

Gar Electrical Instrument Corp., 92-15 172nd St., Jamaica, L. I., N. Y.
(See advertisement on page 146)

Garlynn Engineering Co., 755 Pennsylvania Ave., San Francisco 7, Calif.
Hydrological and surveying instruments.

Gardner Laboratory, Inc., 4723 Elm St., Bethesda 14, Md.
Scientific instruments, automatic inspection devices

Gates & Co., Inc., Geo. W., Hempstead Pike & Lucille Ave., Franklin Square, L. I., N. Y.
Visible and ultraviolet light sources; water leak indicators

Gas Appliance Specialties Co., 32-37 56th St., Woodside, New York, N. Y.
Gas regulators

Gast Mfg. Corp., Box 117, Benton Harbor, Mich.
Vacuum pumps

Gaunt Industries, 827 Irving Park Road, Chicago 13, Ill.
Precision tools, lubrication devices for fine mechanisms

Gaydon Co., 561 Hillgrove Ave., La Grange, Ill.
Automatic controllers; alarm systems

Geier & Bluhm, Inc., 670 River St., Troy, N. Y.
Mechanical devices & spirit level vials
(See advertisement on page 141)

Gelber Co., Samuel S., 162 N. Clinton St., Chicago 6, Ill.
Balancing machines

Gem Instrument Mfg. Co., 6523 Euclid Ave., Cleveland 3, Ohio
Dial indicators

Genales, Andrew, 29 Second Ave., Nyack, N. Y.
Toolroom test indicators

General Biological Supply House, Inc., 761 East 69th Pl., Chicago 37, Ill.
Biological laboratory supplies

General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill.
Switches, cement tester, and spark plug tester

General Control Co., 1200 Soldiers Field Rd., Boston 34, Mass.
Electrical Switches

General Controls Co., 801 Allen Ave., Glendale 1, Calif.
(See also Perfex Controls Div.)
Pressure, temperature & flow control valves
(See advertisement on page 56)

General Cybernetics Associates, 1751 N. Coronado St., Los Angeles 26, Calif.
Computers; automatic controllers; gages

General Devices, Inc., P. O. Box 253, Princeton, N. J.
Remote-control systems; flight-test equipment; switches

General Electric Co., 1 River Rd., Schenectady 5, N. Y.
Electrical instruments & meters
(See advertisement on front cover)

General Electric Co., 1285 Boston Ave., Bridgeport 2, Conn.
Rectifiers & switches

General Electric Co., Carboloy Dept., 11177 E. 8 Mile Dr., Detroit 32, Mich.
Permanent magnets, magnetic alloys

General Electric Co., Chemical & Metallurgical Div., 1 Plastics Ave., Pittsfield, Mass.
Magnets and instrument oils

General Electric Co., Electronics Div., Electronics Park, Syracuse, N. Y.
Oscillographs; tube analyzers; frequency instruments and crystals; nuclear measuring instruments; power supplies

General Electric Co., Instrument Dept., 40 Federal St., West Lynn, Mass. Electrical and electronic instruments; industrial-process instruments and components; aviation instruments; laboratory instruments

General Electric Co., Lamp Dept., Nela Park, Cleveland 12, Ohio
Lighting sources

General Electric Co., Telechron Dept., Ashland, Mass.
Electric clocks; standard clocks; automatic timers; synchronous motors

General Electric Co., Tube Dept., 1 River Rd., Schenectady 5, N. Y.
Electron tubes

General Electric X-Ray Dept., 4855 Electric Ave., Milwaukee 1, Wis.
Medical, dental & industrial X-ray apparatus, accessories & supplies

General Electronic Instrument Co., 98 Park Place, New York 7, N. Y.
Electrical & electronic instruments & components
(See advertisement on page 236)

General Instrument Co., Box 7154, Indianapolis 18, Ind.
Automatic control systems; electrical and mechanical instruments

General Laboratory Supply Co., P. O. Box 2607 Paterson, N. J.
Laboratory apparatus & supplies

General Magnetics, Inc., 135 Bloomfield Ave., Bloomfield, N. J.
Automatic controllers and regulators

General Mills, Inc., Mech. Div., 1620 Central Ave., Minneapolis 13, Minn.
Industrial, aircraft, testing and military instruments; telemetering and control systems

General Physical Laboratory, 509 Fifth Ave., New York 17, N. Y.
Special light sources

General Plate Div., Metals & Controls Corp., Attleboro, Mass.
Thermostatic bimetals

General Precision Lab., Inc., Bedford Rd., Pleasantville, N. Y.
Electrical and electronic instruments, testing equipment

General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass.
Radio & electrical measuring instruments for laboratory & industrial use; stroboscopes noise measuring equipment, measuring & test equipment for electrical communication systems

General Regulator Corp., 165 Broadway, New York 6, N. Y.
Combustion, draft, liquid level & pressure controls

General Scientific Corp., 5151 West 65 St., Chicago 38, Ill.
Lenses & photoelectric cells
(See advertisement on page 175)

General Scientific Equip. Co., 2700 W. Huntington St., Philadelphia 32, Pa.
Automatic water stills; laboratory instruments and accessories

General Test Equipment Co., 38 Argyle Park, Buffalo 9, N. Y.
Pen size radio signal source, also special apparatus

General Tire & Rubber Co., Industrial Products Div., Wabash, Ind.
Shock mountings

General Transistor Corp., 95-18 Sutphin Blvd., Jamaica 35, N. Y.
Transistors; rectifiers; diodes

General Ultrasonics Co., 1240 Main St., Hartford, Conn.
Ultrasonic equipment; instrument cleaning equipment

Genisco Inc., 2233 Federal Ave., Los Angeles 64, Calif.
Testers for aviation instruments, guided missile instrumentation, components, digital-output converters and comparators

Genzlinger, Inc., R. G., Neshaminy, Pa.
Amplifiers; control systems; ultrasonic equipment

Geophysical Instrument Co., Div. Georator Corp., Manassa, Va.
Electrical and electronic balances; radioactivity instrumentation

Georator Corporation, Manassas, Virginia
Geophysical instruments; a-c. and d-c. generators

Geotechnical Corp., 3712 Haggar Drive, Dallas 9, Texas
Geophysical instruments
(See advertisement on page 240)

Gerber Scientific Instrument Co., 162 State St., Hartford 1, Conn.
Analog computers; computing scales

Gerin Corp., P. O. Drawer 1, Avon, N. J.

Germanium Products Corp., 26 Cornelison Ave., Jersey City 4, N. J.
Rectifiers, transistors

Gertsch Products, Inc., 11846 Mississippi Ave., P. O. Box 25856 Los Angeles 25, Calif.
Frequency standards, frequency meters, filters

G. & G. Precision Works, Inc., 5-33 Forty-eighth Ave., Long Island City 1, N. Y.
Mechanical optical & electrical precision instruments

Giannini & Co., G. M., 918 E. Green St., Pasadena 15, Calif.
Aircraft instruments

Gilbert & Barker Mfg. Co., West Springfield, Mass.
Tank gages; automatic samplers

Gilman Scientific Instrument Co., 527 S. Fair Oaks Ave., Pasadena 1, Calif.
Seismographs
(See advertisement on page 201)

Gilmore, E. R., Box 5718, Homewood Sta., Pittsburgh 8, Pa.
Gas leak stethoscopes

Gilmore Industries, Inc., 5511 Euclid Ave., Cleveland 3, Ohio
Automatic-control systems; measuring instruments; telemetering systems; scales; continuous-weighing systems; dynamometers

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Static & dynamic balancing machines

Glass Engineering Laboratories, 601 O'Neill Ave., Belmont, Calif.
Laboratory apparatus; ultra-speed centrifuges

Glass Instruments, Inc., 301 Pasadena Ave., So. Pasadena, Calif.
Glassware; technical glassblowing

Glass Solder Engineering, 845 El Centro St., South Pasadena, Calif.
Hermetic seals

Gleason-Avery, Inc., Auburn, N. Y.
Furnace controls

Glenco Corp., 212 Durham St., Metuchen, N. J.

Globe Industries, Inc., 1784 Stanley Ave., Dayton 4, Ohio
Aircraft instrument testing equipment, aircraft interval timing instruments, aircraft photo equipment, automatic control instruments

Globe Phone Mfg. Corp., 2 Linden St., Reading, Mass.
Pipe locating equipment, leaky valve locators, hearing aids, secret phone or listening equipment for government investigating agencies

Globe Tool & Engg. Co., 410 Davis Ave., Dayton 3, Ohio
Dynamic balancing equipment

Glogau & Co., Inc., 1912 W. Birchwood, Chicago 26, Ill.
Calipers

Glowmeter Corp., 37 Franklin St., Buffalo 2, N. Y.
Condensed Indicating warning system with quantitative displays; qualitative warning signal system; alarm-signal photorecorder

G-M Laboratories, Inc., 4300 N. Knox, Chicago 41, Ill.
Galvanometers and galvanometer relays
(See advertisement on page 128)

G. M. Manufacturing Co., 50 West 3 St., New York, N. Y.
Thermometers, hydrometers, psychrometers, hygrometers

Goerz American Optical Co., C. P., 317 East 34th St., New York 16, N. Y.
Photographic lenses, optical prisms & flats, and other optical units to specification

Gogan Machine Corp., 1440-54 E. 55 St., Cleveland 3, Ohio
Automatic hardness testers

Goldak Co., 1544 W. Glenoaks Blvd., Glendale 1, Calif.
Surveying instruments, pipe locators, leak detectors

Goodrich Co., B. F., 450 South Main St., Akron, Ohio
Vibration absorbers

Goodyear Aircraft Corp., Dept. 931, Akron, Ohio
Differential analyzers and computers

Goodyear Tire & Rubber Co., Inc., Akron 16, Ohio
Aircraft ice-warning equipment

Gordon Co., Claud S., 3000 S. Wallace St., Chicago 16, Ill.
Pyrometers, metallurgical testing machines, thermocouples, thermocouple wire, lead wire, insulators

Gordon Enterprises, 5362 No. Cahuenga Blvd., No. Hollywood, Calif.
Optical instrument testers; photogrammetric instruments; special cameras; optical instruments and components

Gordon Machine & Tool Co., Inc., Ruan & Tackawanna St., Phila. 24, Pa.
Thermocouples; thermocouple wells

Gorman Manufacturing Corp., 2240 Sepulveda Blvd., Los Angeles 64, Calif.

Gorrell & Gorrell, Haworth, N. J.
Equipment for biological & psychological work

Gotham Instruments Div., American Machine & Metals, Inc., 233 Broadway, New York 7, N. Y.
Indicating dial & recording thermometers

Gotham Scientific Co., 106 Water St., New York 5, N. Y.
Laboratory supplies

Gould Co., J. D. 730 E. Washington St., Indianapolis 2, Ind.
Electrically-operated valves

Gow-Mac Instrument Co., 100 Kings Road, Madison, N. J.
Thermal conductivity gas analyzers & gas analysis cells
(See advertisement on page 129)

Graf-Apsco Co., 5868 Broadway, Chicago 40, Ill.
Optical instruments and components; surveying and drafting instruments; military instruments

Graflax Inc., 154 Claressa St., Rochester 8, N. Y.
Scientific cameras

Grain Laboratory Equipment Inc., Long Lake, Minn.
Moisture meters; agricultural instruments; germination cabinets

Gramer-Halldorson Corp., 2734 N. Pulaski Rd., Chicago 39, Ill.
Transformers: instrument, power, adjustable, phasing, regulating

Graphik Circuits, Inc., 221 S. Arroyo Pkwy., Pasadena 1, Calif.
Graphic circuits

Grass Instrument Co., 101 Old Colony Ave., Quincy, Mass.
Kymograph and oscilloscope cameras

Gray Instrument Co., 64 W. Johnson St., Philadelphia 44, Pa.
Scientific instruments
(See advertisements on pages 86, 173)

Graydon Smith Products Corp., 150 Causeway St., Boston 14, Mass.

Grayhill, 561 Hill Grove Ave., LaGrange, Ill.
Switches

Green, Henry J., 1191 Bedford Ave., Brooklyn 16, N. Y.
Meteorological instruments
(See advertisement on page 145)

Green Instrument Co., 383 Putnam Ave., Cambridge 39, Mass.
Engraving machines
(See advertisement on page 116)

Greene Bros., Inc., 1810 Griffin St., Dallas 2, Texas
Laboratory supplies

Greenfield Tap & Die Corp., Greenfield, Mass.
Machine shop gages

Greibach Instruments Corp., 212 Durham Ave., Metuchen, N. J.

Greiner Glassblowing Lab., 3604 E. Medford St., Los Angeles 63, Calif.
Laboratory apparatus; testing and analyzing instruments; supplies
(See advertisement on page 132)

Greiner, Inc., Emil, 20-26 N. Moore St., New York 13, N. Y.
Laboratory supplies

Griebel Co., E., 8 Wayne St., Carbondale, Pa.
Thermometers, hydrometers, chemical & laboratory glassware

Grieve-Hendry Co., Inc., 1811-19 West Lake St., Chicago 12, Ill.
Laboratory ovens

Griner Co., A. J., 1827 McGee St., Kansas City 8, Mo.
Laboratory supplies

Grinnell Co., Inc., 260 W. Exchange St., Providence 1, R. I.
Control valves

Griswold Mfg. Co., F. T., 315 W. Lancaster Ave., Wayne, Pa.
Optical instruments

Grove Valve & Regulater Co., 65th & Hollis Sts., Oakland 8, Calif.
Pump governors, pressure reducing & back pressure regulators for gas or liquid pressures to 6000 lbs.
(See advertisement on page 233)

Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago 12, Ill.
A-c and d-c relays

Gubleman Publishing Co., 100 E. Kinney St., Newark 5, N. J.
Recording charts and papers
(See advertisement on page 94)

Gudeman Co., 9200 Exposition Blvd., Los Angeles 34, Calif.
Electrical and electronic components
(See advertisement on page 227)

Gulton Mfg. Corp., 212 Durham St., Metuchen, N. J.
Accelerometers, ballistocardiographs, precision capacitors

Gurley, W. & L. E., 514 Fulton St., Troy, N. Y.
Surveying & allied engineering instruments, paper testing & aeronautical navigation instruments & standard weights & measures

Gustafson Mfg. Co., G. D., 5328 N. Kedzie St., Chicago 25, Ill.
Instrument tools
(See advertisement on page 172)

Guthery Machine Tool Corp., 3831 Crescent St., Long Island City 1, N. Y.
Instrument lathes

G-V Controls Inc., 28 Hollywood Plaza, East Orange, N. J.
Relays, switches

G. W. Associates, 108 Standard Ave., El Segundo, Calif.
Electrical-instrument calibrating equipment; microwave wattmeters; cathode followers

Gyromechanisms, Inc., New York Ave. at Halesight, Huntington L. I., N. Y.
Gyros; voltage dividing resistors

H

Hacker & Co., Inc., Wm. J., 82 Beaver St., New York 5, N. Y.
Microscopes; spectroscopes; melting-point apparatus; testing machines; optical components

Hadley Assoc., Inc., H. R., 41 Barlow St., Winooski, Vt.
Weighing equipment; automatic fillers; vacuum pumps

Hagan Corp., Hagan Bldg., Pittsburgh 30, Pa.
Combustion control equipment; flow meters, draft & pressure gages for low pressure gas and air measurements: recording, indicating & integrating in any combination
(See advertisement on page 28)

Hagen Mfg. Co., Moline, Ill.
Synchronous motors

Haines Designed Products Corp., 1840 Howell Ave., Dayton 7, Ohio
Photometers

Haledy Electronics Co., 57 William St., New York 5, N. Y.
Automatic timers; photoelectric control systems; synchroscopes; relays and switches

Halliburton Oil Well Cementing Co., Duncan, Okla.
Oil well surveying instruments

Hallikainen Instruments, 1341 Seventh St., Berkeley, Calif.
Automatic-control systems; gas and liquid analyzers; oil-testing instruments; pH equipment; photoelectric instruments; components
(See advertisement on page 238)

Haloid Co., 2-20 Haloid St., Rochester 3, N. Y.
Photocopy equipment

Hamilton Mfg. Co., Two Rivers, Wis.
Laboratory furniture

Hamilton Watch Co., Allied Products Div., Lancaster, Pa.
Chronometers & watches

Hammarlund Mfg. Co., Inc., 460 W. 34th St., New York 1, N. Y.
Electrical and electronic remote-metering and remote-control systems; components
(See advertisement on page 54)

Hammel-Dahl Co., 175 Post Road, (Warwick), Providence 5, R. I.
Automatic control valves
(See advertisement inside back cover)

Hand & Sons Co., John E., Atlantic & Washington Aves., Haddonfield, N. J.
Navigational instruments

Handley Electronics Co., 14758 Keswick St., Van Nuys, Calif.
Voltage-dividing resistors.

Hankison Corporation, 951 Banksville Rd., Pittsburgh 16, Pa.
Filter for instrument air
(See advertisement on page 117)

Hanna Engineering Works, 1765 No. Elston Ave., Chicago 22, Ill.
Air hydraulic cylinders

Hanovia Chemical & Mfg. Co., 100 Chestnut St., Newark 5, N. J.
Quartz mercury arc lamps

Hansen Electronics Co., 7117½ Santa Monica Blvd., Los Angeles 46, Calif.
Graphic circuits; baluns; tape resistors

Hansen Mfg. Co., Inc., Princeton, Ind.
Electric Motors, servomechanism components, clock movements

Hansen Co., Wm., 165 Silverbrook Ave., Niles, Mich.
Timers and clocks

Hanson-Gorill-Brian, Inc., 85 Hazel St., Glen Cove, N. Y.
Aircraft and aviation instruments

Hardwick, Hindle, Inc., 40 Hermon St., Newark 5, N. J.
Resistors

Harrison Radio Corp., 225 Greenwich St., New York 7, N. Y.
Electrical and electronic instruments distribution

Hart Mfg. Co., The, 219 Bartholomew Ave., Hartford, Conn.
Thermostats; relays; switchgear
(See advertisement on page 206)

Hart Mfg. Co., R. E., 5115 Carpenter Rd. Box 72, Ann Arbor, Mich.
Production counters

Hart Moisture Gauges, see Kaydel Moisture Gauges

Hart Moisture Meters, Raymond S. Hart, Inc., 336 W. Islip Blvd., Babylon, L. I., N. Y.
Moisture testers

Harvey Radio Laboratories, Inc., 447 Concord Ave., Cambridge, Mass.
Electronic apparatus

Harvey-Wells Electronics. Southbridge, Mass.
Aircraft navigational instruments

Hasco Valve & Machine Co., 1263 N. 70th St., Milwaukee 13, Wis.
Automatic and manual control valves

Hasler-Tel Co., 30 Vesey St., New York 7, N. Y.
Speed indicators, portable, chronometric

Hass Brothers Instrument Co., 6236 Ritchie Rd., Washington 28, D. C.
Barometers, Altimeters, Manometers
(See advertisements on pages 83, 144)

Hastings Instrument Co., P. O. Box 1275, Wythe Branch, Hampton, Va.
Consulting instrument engineers, special developments

Hathaway Instrument Co., 1315 S. Clarkson St., Denver 10, Colo.
Instruments & apparatus for electrical & mechanical measurements & control

Hausser & Son, C. A., 6040 Belfield Ave., Philadelphia 44, Pa.
Laboratory apparatus; biological instrumentation

Hawk Tool & Engineering Co., Inc., Clarkston, Mich.
Controllers & testing devices

Haydon Co., A. W., 232 N. Elm St., Waterbury 32, Conn.
Relays and timers
(See advertisement on page 225)

Haydon Manufacturing Co., 245 E. Elm St., Torrington, Conn.
Synchronous Motors, automatic timers

Haydon Switch Co., 232 North Elm St., Waterbury 32, Conn.
Switches

Hayes Scientific Appliances, 202 N. Broadway, Urbana, Ill.
Scientific instruments

Hays Corp., The, P. O. Box 299, Michigan City, Ind.
Industrial process measurement and control instrumentation

Hays Mfg. Co., Indus. Sales Div., 12th & Liberty Sts., Erie 6, Pa.

Hayward Scientific Glass Co., 217 Magnolia St., Whittier, Calif.
Optical instruments and components
(See advertisement on page 162)

H-B Instrument Co., Inc., American & Bristol Sts., Philadelphia 40, Pa.
Thermometers & hydrometers, remote control equipment

HD Electric Co., 760 Osterman Ave., Deerfield, Ill.
Split core ammeters, demand meters

Hebler Co., W. O., 1294 Central Ave., Hillside, N. J.
Electrical gas analyzers

Hedin Tele Technical Corp., 640 West Mt. Pleasant Ave., Livingston, N. J.

Heil Scientific, Inc., 214 S. 4 St., St. Louis 2, Mo.
Laboratory supplies

Heiland Div., Minneapolis-Honeywell, 130 E. 5th Ave., Denver 9, Colo.
Oscillographs; amplifiers; galvonometers; geophysical instruments
(See advertisement on page 73)

Heinemann Electric Co., P. O. Box 299, Trenton 2, N. J.

Heise Bourdon Tube Co., Brook Rd., Newton, Conn.
Bourdon tube devices
(See advertisement on page 126)

Helicoid Gage Div., see American Chain & Cable Co.

Helio Instrument Co., Inc., 1 S. Reed St., E. Riverton, N. J.
Laboratory and industrial optical instrumentation and components

Helipot Div., Beckman Insts., Inc., 916 Meridan Ave., South Pasadena 8, Calif.
Rheostats, voltage dividing resistors

Heller Co., Gerald K., 1 N. Carey St., Baltimore 23, Md.
Manual motor controls
(See advertisement on page 155)

Hellige, Inc., 877 Stewart Ave., Garden City, N. Y.
Scientific instruments, laboratory & bacteriological supplies

Henderson & Co., H. B., East Liverpool, Ohio
Pyrometric cones

Henry Valve Co., Inc., 3215 North Ave., Melrose Park, Ill.
Control valves

Henschel & Co., Inc., John, 105 E. 29th St., New York 16, N. Y.
Drawing instruments

Henschel Corp., 14 Cedar St., Amesbury, Mass.
Ordnance and marine instrumentation; relays

Henson Co., Fred C., 3311 E. Colorado St., Pasadena, Calif.
Electroscopes, optical instruments and components
(See advertisement on page 240)

Henszey Co., Watertown, Wis.
Feed water meters, flow indicators continuous blowdown, heat exchangers and boiler feed regulators. Also meters and flow indicators for corrosive chemicals.

Herbach & Rademan, Inc., 1204 Arch St., Philadelphia 7, Pa.
Laboratory Supplies

Herd, Harold H., 1830 Fletcher St., So. Pasadena, Calif.
Instrument scales and dials; photo-etched recticles

Herman Stone Co., 324 Harries Bldg., Dayton 2, Ohio
Precision granite surface plates

Herman, Victor George, 311 W. 97th St., New York 25, N. Y.

Hermetic Sealing Corp., 99 E. Hawthorne Ave., Valley Stream, L. I., N. Y.
Electrical and electronic test equipment

Herron Optical Co., 9117 S. Main St., Los Angeles 61, Calif.
Lenses, mirrors and optical parts
(See advertisement on page 160)

Hetherington & Berner, 701 Kentucky Ave., Indianapolis 7, Ind.
Fluidometers

Hetherington Inc., 1200 Elmwood Ave., Sharon Hill, Pa.
Switches

Hett Associates, 603 Grand Ave., Englewood, N. J.

Heusser Instrument Mfg. Co., 1388 S. State St., Salt Lake City 4, Utah
Analytical balances

Hevi-Duty Electric Co., 4212 W. Highland Ave., Milwaukee 1, Wis.
Electric furnaces

Hewlett-Packard Co., 395 Page Mill Road, Palo Alto, California
Electronic equipment

Hewson Co., Inc., The, 443 Broad St., Newark 2, N. J.
Electrical instruments

Hexacon Electric Co., 161 W. Clay Ave., Roselle Park, N. J.
Electric soldering irons

Heyman Mfg. Co., 530 Michigan Ave., Kenilworth N. J.
Inspection instruments

H & H Thermostats, Inc., 682 Broadway, New York 12, N. Y.
Altimeters, recording thermometers, recorder ink for extreme temperatures

Hickok Electrical Instrument Co., 10519 Dupont Ave., Cleveland 21, Ohio
Electric indicating instruments
(See advertisement on page 2)

Hi-G, Inc., Bradley Field, Windsor Locks, Conn.
Relays

Hieatt Engineering Co., P.O. Box 349, Burbank, Calif.
Environmental testing equipment, except vibration-shock

Hiergesell & Sons, Wm., 295 Pearl St., New York 7, N. Y.
Thermometers & hydrometers
(See advertisement on page 221)

High Vacuum Equipment Corp., 349 Lincoln St., Hingham, Mass.
Vacuum pumps and gages

High Voltage Engineering Corp., 7 University Road, Cambridge, Mass.
High voltage devices

Hill & Co., E. Vernon; P. O. Box 189, Lake Geneva, Wisc.
Aerological instruments, accessories.

Hills-McCanna Co., 3025 N. Western Ave., Chicago 18, Ill.
Diaphragm valves, metering and proportioning pumps

Hillyer Instrument Co., Inc., 54-60 Lafayette St., New York 13, N. Y.
Computers and inspection devices

Hobbs Corp., J. W., 2048 Yale Blvd., Springfield, Ill.
Running-time meters; pressure switches

Hogan Laboratories, Inc., 155 Perry St., New York 14, N. Y.
Computers; wave filters; chemical analyzers; densitometers; concentration recorders

Hoke, Inc., S. Dean St. & Garrett Pl., Englewood, N. J.
Regulators

Holtzer-Cabot Electric Div., National Pneumatic Co., Inc., 420 Lexington Ave., New York 17, N. Y.
Fractional Horsepower Motors

Hopkins Engineering Co., 2082 Lincoln Ave., Altadena, Calif.
Electronic components and hardware

Hopp Press, Inc., 460 W. 34 St., New York 1, N. Y.
Nameplates, dial faces, scales, instruction plates

Hoskins Mfg. Co., Lawton Ave. & Buchanan St., Detroit 8, Mich.
Pyrometers; laboratory furnaces; thermocouples

Houston Technical Laboratories, 2424 Branard St., Houston 6, Texas
Gravity meters for geophysical prospecting

Howard Industries, Cyclohm Div., 1760 State St., Racine, Wisc.
Motors, generators, motor starters

Howe & French Inc., 99 Broad St., Boston 10, Mass.
Laboratory supplies

Howe Scale Co., Inc., Rutland, Vt.
Scales

Howell Instrument Co., Inc., 1106 Norwood, Fort Worth, Texas
Electrical and electronic instruments; automatic regulators

Howland Optical Co., 29 Cottage Place, Nutley 10, N. J.
Optical flats lenses, magnifiers

Hudson Radio & Television Corp., 48 W. 48th St., New York, N. Y.
Electrical and electronic instruments and supplies

Hufco Industries, 2815 W. Olive St., Burbank, Calif.
Relays

Huggins Labs., 711 Hamilton Ave., Menlo Park, Calif.
Laboratory instruments, industrial photoelectric instruments, fused quartz apparatus, colorimeters

Hughes Aircraft Co., Semiconductor Div., 5200 W. 164th St., Los Angeles 45, Calif.
Germanium and silicon diodes; photocells

Charles A. Hulcher Co., Inc., 40 Manteo Ave., Hampton, Va.
High-speed cameras; stroboscopic light sources

Hull Mfg. Co., P. O. Box 246, Warren, Ohio
Compasses

Humboldt Mfg. Co., 2014 N. Whipple St., Chicago 47, Ill.
Cement & concrete testers

Humphrey, Inc., 621 Fourth Ave., San Diego 1, Calif.
Automatic timers; remote control equipment; bridges; potentiometers; aircraft instruments; dynamometers

Hunt & Son, Inc., P. O. Box 337, Salem, Ohio
Electrically-operated, diaphragm, solenoid, and high pressure valves

Hunter Spring Co., Lansdale, Pa.
Special springs

Huppert Co., K. H., 6830-32 S. Cottage Grove Ave., Chicago 37, Ill.
Laboratory furnaces

Hycon Mfg. Co., 2961 E. Colorado St., Pasadena 8, Calif.
Oscilloscopes, cameras, centrifuges, frequency meters & regulators
(See advertisement on page 30)

Hycor Co., Inc., 11423 Vanowen St., North Hollywood, Calif.
Electric and electronic components
(See advertisement on page 198)

Hydraulic Controls Co., 87 Terrace St., Roxbury 20, Boston, Mass.
Hydraulic and mechanical servomechanisms; components

Hyde Instrument Corp., 2377 E. Washington St., Pasadena 7, Calif.
Optical gages; surveying instruments

Hydro-Aire Inc., Div. of Crane Co., 3300 Winona Ave., Burbank, Calif.
Transistors

Hydroway Scales, 20624 W. 8 Mile Rd., Detroit 19, Mich.
Indicating scales

Hygrotester, Inc., P. O. Box 923, Brooklyn 1, N. Y.
Moisture measurement and control equipment; paper testing instruments

I

Ideal Industries, Inc., 1420 Park Ave., Sycamore, Ill.
insulation testers & revolution counters

Ideal-Aerosmith, Inc., 12909 S. Cerise Ave., Hawthorne, Calif.
Aircraft instrument test apparatus, sensitive needle valves
(See advertisement on page 9)

Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago 10, Ill.
Indicating pyrometers, resistance thermometers pyrometer controllers air velocity meters, metal detectors
(See advertisement on page 26)

I-L-S Instrument Corp., 18701 Briggs Rd., Cleveland 11, Ohio
Electrical and electronic instruments; power supplies
(See advertisement on page 208)

Imetra Co., Ltd., 136 Liberty St., New York 6, N. Y.
Instrument pivots and bearings

Impact Register Co., P. O. Box 445, Champaign, Ill.
Instruments for determining and recording impacts received by railroad cars and riding qualities of railroad cars, automobiles

Impact-O-Graph Corp., 1900 Euclid Ave., Cleveland, 15, Ohio
Impact recorders

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill.
Fittings, tubing cutters and benders

Indiana Steel Products Co., Valparaiso, Ind.
Instrument magnets

Indikon Co., 248 Trapelo Rd., Belmont 78, Mass.
Electrical instruments; gaging devices; data-handling and remote control systems

Industrial Cold Co., 1000 E. McNichols Rd., Detroit 3, Mich.
Low-temperature and altitude test chambers

Industrial Condenser Corp., 3243-65 N. California Ave., Chicago 18, Ill.
Oil paper & electrolytic capacitors

Industrial Control Co., Straight Path and Arlington Ave., Wyandanch, L. I., N. Y.
Electrical instruments, servo amplifiers

Industrial Control Panel Co., 517 W. Monroe St., Chicago 6, Illinois
Automatic control systems and components

Industrial Devices, Inc., 22 State Rd., Edgewater, N. J.
Electrical measuring instruments

Industrial Electronic Controls Co., 2271 E. 14th St., Brooklyn 29, N. Y.
Control systems; relays; counters; alarms

Industrial Electronics Co., Inc., Hanover, Mass.
Dimensional, smoke-density and liquid-level instruments

Industrial Electronics, Inc., 8060 Wheeler St., Detroit 10, Mich.
Cathode-ray oscillograph
Electrical testing sets

Industrial Engineering Corp., 525 E. Woodbine, Louisville 8, Ky.
Testing instruments and equipment; control boards, panels and racks; test chambers
(See advertisements on pages 167, 179, 210, 233)

Industrial Engineering Corp., Rea Bldg., Terre Haute, Ind.
Relays

Industrial Filter & Pump Mfg. Co., 5900 Ogden Ave., Chicago 50, Ill.
Salt spray testers

Industrial Gauges Corp., Electro-Autosizing Mach. Div., 40 Grand Ave., Englewood, N. J.
Gaging and inspection devices; remote control equipment

Industrial Instrument Corp., P. O. Box 1909, Odessa, Texas

Industrial Instruments, Inc., 89 Commerce Rd., Cedar Grove, N. J.
Electrical measuring & test equipment
(See advertisement on page 27)

Industrial Nucleonics Corp., 1205 Chesapeake Ave., Columbus 12, Ohio
Nuclear instruments, inspection devices

Industrial Process Engineers, 8 Lister Ave., Newark 5, N. J.
Powdered and granular materials instrumentation; bin-level controllers and indicators

Industrial Pyrometer & Supply Co., Alton, Ill.
Thermocouples

Industrial Scientific, Inc., P. O. Box 1017, Houston 1, Texas
Laboratory supply house

Industrial Scientific Inc., 1014 Taylor St., Fort Worth 2, Texas
Laboratory supplies

Industrial Test Equipment Co., 55 East 11th St., New York, N. Y.
Electrical testing equipment; generators; volt and watt meters
(See advertisement on page 168)

Industrial Timer Corp., 115 Edison Place, Newark 5, N. J.
Industrial timers, motor driven, with automatic reset. Controllers, signals, testing equipment for electrical parts (operation or life test)

Industro, Inc., 649 Broadway, New York 12, N. Y.
Electron tubes; transistors

Industrol Corp., 494 Westfield Ave., Roselle Park, N. J.
Air dryers and gas sample dryers

Industronics, Box 424, Arlington Heights, Ill.
Power supplies; generators

Inet Div., Leach Corp., 4441 S. Santa Fe Ave., Los Angeles 58, Calif.
Automatic regulators; power supplies; generators; rectifiers

Inferno Co., Box 1138, Shreveport 90, La.
Combustion instruments

Ingersoll-Rand Company, 11 Broadway, New York 4, N. Y.
Instrument air compressors

Insco Co., Div. of Barry Controls, Inc., Hollis St., Groton, Mass.
Design, development and manufacture of electromechanical apparatus.
(See advertisement on page 241)

Instrof, Inc., 4923 Pentridge St., Philadelphia 43, Pa.
Racks, housings, covers

Instron Engineering Corp., 2, Hancock St., Quincy 71, Mass.
Testing machines

Instrument Associates, Great Neck Road, Great Neck, N. Y.
Aviation and ground instrumentation

Instrument Components, Inc., Div. of Belock Inst. Corp., 111th St. & 14th Ave., College Point, N. Y.
Electromechanical components

Instrument Development Labs., Inc., 163 Highland Ave., Needham Heights 94, Mass.
Photoelectric color analyzers; digital converters

Instrument Development & Mfg. Corp., 3018 East Foothill Blvd., Pasadena 8, Calif.
Remote control equipment; sliprings; air cylinders; electrical instruments; valves

Instrument Electronics Corp., 90 Main St., Port Washington, N. Y.
Vacuum-tube voltmeters

Instrument Electronics Corp., 104 W. Jefferson St., Falls Church, Va.
Electronic instruments

Instrument Engineering Service, R. 3, Box 345, Michigan City, Ind.
Gas analysis and combustion instrumentation

Instrument Laboratories, 315 W. Walton Place, Chicago 10, Ill.
Electrical testing sets
(See advertisement on page 79)

Instrument Laboratory Inc., P. O. Box 4098, Interbay Station, 126 Elliott Ave., Seattle 99, Washington
Counting & indicating instruments

Instrument Motors Co., P. O. Box 5, Stamford, Conn.
(See advertisement on page 152)

Instrument Resistors Co., 1036 Commerce Ave., Union, N. J.
Instrument resistors

Instruments Corp., 4 N. Central Ave., Baltimore 2, Md.
Meteorological instruments

Instruments Inc., 122 North Madison, Tulsa, Okla.

Insulated Circuits Inc., 115-121 Roosevelt Ave., Belleville, N. J.

Insuline Corp. of America, 186 Granite St., Manchester, N. H.
Capacitance meters; electrical and electronic components

Intercontinental Marketing Corp., 251 Fourth Ave., New York 10, N. Y.
Oscilloscope cameras

International Business Machines Corp., 590 Madison Ave., New York 22, N. Y.
Scales & time instruments

International Correspondence Schools, Scranton 9, Pa.
Instrument education courses

International Crystal Mfg. Co., Inc., 18½ North Lee, Oklahoma City, Okla.
Quartz crystals

International Development Co., 1 South Reed St., E. Riverton, N. J.
Optical and mechanical instruments and components
(See advertisement on page 97)

International Instrument Co., Canyon, Calif.
Process control devices; chemical instrumentation; relays; components

International Instruments, Inc., P. O. Box 2954, New Haven 15, Conn.
Electrical and electronic instruments

International Microscope & Art Co., 7544 N. Ridge, Chicago 45, Ill.
Microscopes

International Radiant Corp., 40 Matinecock Ave., Port Washington, N. Y.
Testing chambers and ovens
(See advertisement on page 91)

International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif.
Photoelectric cells and dry disc rectifiers
(See advertisement on page 187)

International Register Co., 2620 W. Washington Blvd., Chicago 12, Ill.
Coin meters—timers for electric ranges & gas ovens

International Research & Dev. Corp., 797 Thomas Lane, P. O. Box 1707, Columbus 16, Ohio
Vibration analysis and balancing instruments and machines; amplifiers; probes and accessories

International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.
Metallized & wirebound fixed & variable resistors including high voltage & high frequency types

International Standard Trading Corp., 22 Thames St., New York 6, N. Y.
Electrical and electronic instruments; components

International Telemeter Corp., 2000 Stoner Ave., Los Angeles 25, Calif.
Computers; complex-wave generators; electronic components

Ircal Industries, 2242 Sepulveda Blvd., Los Angeles 64, Calif.
Resistors

Islip Radio Mfg. Corp., Foot of Beech St., Islip, N. Y.
Amplifiers

I.T.E. Circuit Breaker Co., 19th & Hamilton Sts., Philadelphia 30, Pa.
Fixed and variable resistors; manganin resistors; switchgear

Ithaca Scientific Instrument Co., Ithaca, N. Y.
Drawing instruments

J

Jackes-Evans Mfg. Co., 4427 Geraldine Ave., St. Louis 15, Mo.
Automatic-control valves

Jackson Co., Byron, 2010 Lincoln Ave., Pasadena 3, Calif.
Pressure and vacuum gages
(See advertisement on page 35)

Jackson Electrical Instrument Co., 18 S. Patterson Blvd., Dayton 2, Ohio
Radio testing equipment

Jacobs Instrument Co., 4718 Bethesda Ave., Bethesda 14, Md.
Ballistic instruments

Jacoby-Tarbox Corp., 808 Nepperhan Ave., Yonkers, N. Y.
Moisture meters; rotameters; sight flow meters

B. Jadow, Inc., 860 Broadway at 17th St., New York 3, N. Y.
Dimensional gaging equipment; special lubricants; fractional-hp. motors

Jaeger Watch Co., Inc., 304 East 45th St., New York 17, N. Y.
Automobile clocks, timepieces for aviation and marine, chronomatic tachometers & true airspeed indicators

Jaidinger Mfg. Co., 1921 W. Hubbard St., Chicago 22, Ill.
Temperature controllers; relays; switches

James-Pond-Clark, 2181 E. Foothill Blvd., Pasadena 8, Calif.
Check valves; relief valves
(See advertisement on page 230)

James Vibrapower Company, 4036 N. Rockwell St., Chicago 18, Illinois

Jansson Gage Co., 13550 Auburn Ave., Detroit 23, Mich.
Gage block sets; sine bars; tri squares; accessories

Jarco Services, Inc., 725 South Erie St., Tulsa, Okla.
Electrical and electronic instruments; automatic control systems; components

Jardur Import Co., 874 Broadway, New York 3, N. Y.
Chronographs & stop-watches

Jarrell-Ash Co., 26 Farwell St., Newtonville (60), Mass.
Representatives for Adam Hilger, Ltd., manufacturers of optical instruments
(See advertisement on page 79)

Jarvis Electronics Corp., 6058 W. Fullerton Ave., Chicago 39, Ill.
Aircraft navigational instruments; resistors

Jasonols Chemical Corp., 1085 Myrtle Ave., Brooklyn, N. Y.
Laboratory apparatus and supplies; scintillation crystals and chemicals

J B L Instrument Co., Sycamore & Mill Rd., Clifton Heights, Pa.
Rotary instrument switches, transformer tapping, railway signal gear, decade resistance boxes

J-B-T Instruments, Inc., 443 Chapel St., New Haven 8, Conn.
Electrical measuring & controlling instruments: pyrometers, thermocouples, selector switches, potentiometers, resistance thermometers, laboratory instruments
(See advertisement on page 242)

Jeffrey Mfg. Co., P. O. Box 1879, Columbus, 16, Ohio
Weighing, feeding, batching & proportioning equipment

Jenkins Bros., 100 Park Ave., New York 17, N. Y.
Regulating valves

Jerpbak-Bayless Co., Solon Rd., Solon, Ohio

Jerguson Gage & Valve Co., 87 Fellsway, Somerville 45, Mass.
Precision gages & valves
(See advertisement on page 122)

Jersey City Technical Lab., 880 Bergen Ave., Jersey City 6, N. J.
Electrical and electronic instruments; power supplies

Jessup Eng. & Dev. Co., Micro Drill Guide Div., 3980 Superior St., Deer Park, Ohio
Dimensional equipment; orifice fittings; regulators

JFD Manufacturing Co., Inc., 6101-16th Ave., Brooklyn 4, N. Y.
Variable capacitors; quartz; dielectric materials

Jo-Bell Products, Inc., 4840 South St. Louis Ave., Chicago 32, Ill.
Liquid level alarms, magnetic proximity switches

Jo-Line Tools, Inc., 8442 Otis St., South Gate, Calif.
Torque measurement and control equipment

Johanson Mfg. Co., P. O. Box 327, Boonton, N. J.
Variable and precision capacitors

Johansson Gage Co., See Swedish Gage Co. of America

Johnson Co., E. F., Gothard Div., Waseca, Minn.
Connectors, plugs, dial lights, etc.

Johnson Corp., 805 Wood St., Three Rivers, Mich.
Automatic boiler controls; compressed-air cleaners

Johnson Engrg. Co., Inc., Welton V., 95 Summit Ave., Summit, N. J.
Instrument bearings, shafts, pivots, tubing and special lubricants
(See advertisement on page 203)

Johnson Gage Co., 534 Cottage Grove Rd., Bloomfield, Conn.
Comparators & gages

Johnson Gas Appliance Co., 565 E. Ave. N.W., Cedar Rapids, Iowa
Laboratory furnaces

Johnson Scientific Instrument Co., 2915 Maples Ave., Berwyn, Ill.
Biological instruments, instrument-repair tools

Johnson Service Co., 507 E. Michigan St., Milwaukee 2, Wisc.
Automatic temperature & humidity control for heating, cooling, ventlaiting, air conditioning & industrial processes

Johnson-Williams, Ltd., P. O. Box 6, Sta. A, Palo Alto, Calif.
Combustible gas indicators & alarm systems, portable & continuous, including accessories
(See advertisement on page 111)

Johnston & Jennings Company, 877 Addison Rd., Cleveland 14, Ohio
Depth gages, valves

Jones Div., Howard B. Cinch Mfg. Co., 1026 S. Homan Ave., Chicago 24, Ill.
Connectors

Jones Electronics Co., M. C., 96 N. Main St., Bristol, Conn.
Standing wave meter

Jones & Lamson Machine Co., 160 Clinton St., Springfield, Vt.
Optical comparators

Jones-Motrola Corp., P. O. Box 825, 432 Fairfield Ave., Stamford, Conn.
Tachometers, speed indicators & speedometers

Jones Optical Works, A. D., 2400 Massachusetts Ave., Cambridge, Mass.
Lenses, light filters and optical parts

Jordan Electronics, Inc., 3025 W. Mission Rd., Alhambra, Calif.
Radioactivity counters and detectors; gas analyzers

Jordan Regulator Corp., 6013 Wiehe Rd., Cincinnati 13, Ohio
Automatic controllers, governors and regulators; remote-control systems; laboratory apparatus

Joyro Associates, 488 Latham Road, Mineola, Long Island, N. Y.
Special side rules

K

Kaar Engineering Co., 2995 Middlefield Rd., Palo Alto, Calif.
Radio and navigation instruments

Kahl Scientific Instrument Co., Box 1166, El Cajon, Calif.
Thermometer, hydrometer, psychrometers, hygrometers

Kahn Co., Inc., 541 Windsor, Hartford 1, Conn.

Kansas City Laboratory Supply Co., 307 Westport Road, Kansas City 11, Mo.
Laboratory supplies

Karl-Douglas Associates, 3160 W. El Segundo Blvd., Hawthorne, Calif.
Electrical automatic regulators; magnetic amplifiers

Karn Chemical Equipment Co., 518 Dickson Ave., Pittsburgh 2, Penna.
(See advertisement on page 220)

Karp Metal Products Co., Inc., 211-277 63 St., Brooklyn 20, N. Y.
Instrument panels

W. A. Kates Co., 430 Waukegan Rd., Deerfield, Ill.
Automatic flow and pressure controllers
(See advertisement on page 18)

Kauffman-Lattimer Co., 230 N. Front St., Columbus 16, Ohio
Laboratory supplies

Kay Electric Co., 14 Maple Ave., Pine Brook, N. J.
Electronic instruments

Kay-Lab, 1076 Morena Blvd., San Diego 10, Calif.
Audio frequency equipment, bridges, capacitance meters

Kaydel Moisture Gauges, 126 Liberty St., New York 6, N. Y.
Moisture meters

Kaye Development Co., Connecticut Ave., So. Norwalk, Conn.
Optical, electrical, mechanical and photographic instruments and components

Kaye & MacDonald, Inc., 11-15 Central Ave., West Orange, N. J.
Automatic controllers and regulators

Kearfott Company Inc., 1378 Main Ave., Clifton, N. J. Western Mfg. Div., 14844 Oxnard St., Van Nuys, Calif.
Aircraft and aviation instruments and automatic dash control system; motors; electrical instruments and components
(See advertisement on page 202)

Keckley Co., O. C., 400 W. Madison St., Chicago 6, Ill.
Steam and liquid control equipment

Keithley Instruments, 3868 Carnegie Ave., Cleveland 15, Ohio
Amplifiers

Kelley-Koett Mfg. Co., Inc., Covington, Ky.
X-Ray apparatus

Kellogg Switchboard & Supply Co., 76 W. Monroe St., Chicago 8, Ill.
Relays

Kemp Mfg. Co., C. M., 405 E. Oliver St., Baltimore 2, Md.
Air and gas dehydrators

Kendall Controls Corp., 144 Moody St., Waltham, Mass.
Valve-operating devices; control valves; automatic controllers

Kent Cliff Laboratories, P. O. Box 696, Peekskill, N. Y.
Hardness testers

Kenyon Instrument Co., Inc., 1345 New York Ave., Huntington, L. I., N. Y.
Airport & marine instruments

Kenyon Transformer Co., Inc., 840 Barry St., New York 59, N. Y.
Instrument and power transformers; filters; chokes
(See advertisement on page 42)

Kepco Laboratories, Inc., 131-38 Sanford Ave., Flushing 55, L. I., N. Y.
Radio test panels

Kessler Co., Walter H., 180 Lafayette St., New York, N. Y.
Thermometers and hydrometers

Kester Solder Co., 4201 Wrightwood Ave., Chicago 39, Ill.
Cored solders

Keuffel & Esser Co., Adams & Third Sts., Hoboken, N. J.
Surveying instruments

Kewaunee Mfg. Co., End So. Center St., Adrian, Mich.
Laboratory furniture

Keystone Carbon Co., Inc., Saint Marys, Pa.
Carbon resistors

Keystone Products Co., 904-6 Twenty-Third St., Union City, N. J.
Power supplies; transformers; magnetic amplifiers; components

Kieley & Mueller Inc., 64 Genung St., Middletown, N. Y.
Pressure regulating & flow control devices
(See advertisement on page 31)

Kimble Glass Co., Vineland, N. J.
Glass apparatus, glass tubing, thermometers, hydrometers

Kinetic Engineering Co., M-217, Delaware Trust Bldg., Wilmington 1, Del.
Flow-rate and proportioning measurement and control equipment

Kinetic Instrument Co., 3250 Skokie Valley Rd., Highland Park, Ill.
Laboratory apparatus; electrical and electronic instruments; relays

Kinetix Inst. Div., Ketay Instrument Corp., Commack, L. I., N. Y.
Servomotors; resolvers; synchros

King, Andrew, P. O. Box 606, Ardmore, Pa.
Portable Brinnell hardness tester

King Engineering Corporation, 415 Detroit St., Ann Arbor, Mich. Liquid level indicators, distant reading
(See advertisement on page 144)

Kinney Manufacturing Div., The New York Air Brake Co., 3529 Washington St., Boston 30, Mass.
Vacuum pumps and valves

Kirk & Blum Manufacturing Co., 3120 Forrer St., Cincinnati 9, Ohio
Instrument panels and sheet metal assemblies
(See advertisement on page 4)

Kirkland Co., H. R., 10 King St., Morristown, N. J.
Signaling devices; pilot lights

Kistler Instrument Co., 2446 Pierce Ave., Niagara Falls, N. Y.
Pressure transducers and transducer amplifier for oscillographic indication of instantaneous pressure transients.
(See advertisement on page 181)

Kleinschmidt, Inc., County Line Rd., Deerfield, Ill.
Data processing equipment; digital readouts

Klett Mfg. Co., 179 E. 87th St., New York 28, N. Y.
Colorimeters

Klipfel Valves, Inc., Div. of Hamilton-Thomas Corp. 1075 Lincoln Ave., Hamilton, Ohio
Automatic controllers and components

Knights Company, James, Sandwich, Ill.
Crystals

Koch & Co., F. A., 72 Spring St., New York 12, N. Y.
Laboratory supplies

Kocour Co., 4800 S. St. Louis, Chicago 32, Ill.
Dimensional, chemical and electrical instruments

Koehler Instrument Co., Inc., 168-56 Douglas Ave., Jamaica 3, N. Y.
(See advertisement on page 81)

Kohler Co., P. O. Box A, Kohler, Wisconsin
Valves and valve-operating devices

Kollmorgen Optical Co., 30 Church St., New York 7, N. Y.
Astronomical & optical instruments
(See advertisement on page 167)

Kollsman Instrument Corp., Subsidiary of Standard Coil Products Co., Inc., 80-08—45th Ave., Elmhurst, Long Island, N. Y.
Precision instruments for aircraft
(See advertisement on page 154)

Kontes Glass Co., Spruce St., Vineland, N. J.
Glass apparatus, instruments and parts
(See advertisement on page 129)

Kopp Scientific, Inc., 15 Park St., Springfield, Mass.
Microchemical and micromechanical apparatus; blood-test apparatus; automatic time switches

Krohn-Hite Instrument Co., 580 Massachusetts Ave., Cambridge 39, Mass.
Computers, nuclear instruments

Krouse Testing Machine Inc; 573 E. 11th Ave., Columbus 3, Ohio
Fatigue testing machines

Harold Kruger Instruments, P. O. Box 164, San Gabriel, Calif.
Gas-analyzers; spectrophotometers

Kunkle Valve Co., 119 So. Clinton St., Ft. Wayne 2, Ind.
Valves

Kurman Electric Co., Inc., 35-18 37th St., Long Island City 1, N. Y.
Relays and relay switches

Kushner Laboratories, Joseph B., 115 Broad St., Stroudsburg, Pa.
Surface tension measuring instruments

Kybernetes Corp., 9 E. 40th St., New York 16, N. Y.
Scanning systems; annunciators; process measurement and control equipment and components

L

L. A. B. Corp., P. O. Box 278, Skaneateles, N. Y.
Special instruments

Labline, Inc., 217 N. Des Plaines St., Chicago 6, Ill.
Laboratory apparatus; testing equipment; components

Laboratory Construction Co., 1113-15 Holmes St., Kansas City 6, Mo.
Laboratory furniture & apparatus

Laboratory Equipment Corp., Box 352, St. Joseph, Mich.
Carbon & sulphur determinators

Laboratory for Electronics, Inc., 75 Pitts St., Boston 14, Mass.
Computers, electrical and electronic instruments

Laboratory Furniture Co., Inc., Old Country Road, Mineola, L. I., N. Y.
Laboratory furniture

Laboratory Materials Co., 7319 Vincennes Ave., Chicago 21, Ill.
Laboratory supplies

Laboratory Optical Co., State Highway 29, Plainfield, N. J.
Optical inspection instruments; components; cameras

Laboratory Specialties, Inc., 144 S. Wabash St., Wabash, Ind.
Mirrors—front surfaces & aluminized: Monochromatic light sources, Black light apparatus, Diffraction gratings, Spectroscopes, Fluorescent & phosphorescent materials

Lab-Tronics, Inc., 1115 W. Washington Blvd., Chicago 7, Ill.
Laboratory apparatus; electrical and electronic instruments; components

Lafayette Instrument Co., N. 26 St., Lafayette, Ind.
Electrical and electronic instruments; motors; optical projectors; lie detectors; special timepieces

Lake Erie Electric Mfg., Inc., 2952 W. 22nd St., Erie, Pa.
Combustion control equipment; components

La Marche Mfg. Co., 6525 Olmsted Ave., Chicago 31, Ill.
Constant voltage regulators, rectifiers

Lambda Electronics Corp., 103-02 Northern Blvd., Corona 68, N. Y.
Power supplies

Lammert & Mann Co., 260 N. Woods St., Chicago 12, Ill.
Flow regulators & valves

LaMotte Chemical Products Co., Towson, Md.
Hydrogen ion apparatus

Lampkin Laboratories, Inc., Bradenton, Fla.
Radio-frequency meters

Lancaster Lens Co., 220-226 W. Main St., Lancaster, Ohio
Optical components
(See advertisement on page 163)

Land-Air Inc., 440 W. Superior St., Chicago 10, Ill.
Aircraft flight analyzers; hazardous gas detectors; reed electrometers

Landis & Gyr, Inc., 45 West 45th St., New York 36, N. Y.
Electric integrating meters; indicating & graphic demand meters for KW, KVA, reactive; prepayment meters; totalizing & remote; time switches; motor wound escapement or synchronous motor types with astronomic dials; miniature ball bearings

Landsverk Electrometer Co., 550-552 W. Garfield Ave., Glendale 4, Calif.
Radiocativity instruments, counters and probes
(See advertisement on page 186)

Langevin Mfg. Corp., 37 W. 65th St., New York 23, N. Y.
Power supplies; transformers

La Pine & Co., Arthur S., 6001 So. Knox Ave., Chicago 29, Ill.
Laboratory supplies

Lapp Insulator Co., Inc., 125 Wilson St., Le Roy, N. Y.
Automatic feeders and regulators, pumps, laboratory ware

Larrimore Sales Co., P. O. Box 1234, St. Louis 1, Mo.
Magnifiers

Larson Instrument Co., 24 Orchard St., Tarrytown, N. Y.
Combustion control equipment; electrical test instruments; remote control equipment; relays; time, temperature recorders and controllers

Lavoie Laboratories, Matawan Freehold Rd., Morganville, N. J.
Ultra high frequency precision frequency meter

Lawrence & Hill, Inc., 142 Main Ave., Watertown, N. Y.
Gages & gaging fixtures

Lawter Chemicals Inc., 3563 Touhy Ave., Chicago 45, Ill.
Luminous and fluorescent chemicals and coatings

Leach Relay Co., 5915 Avalon Blvd., Los Angeles 3, Calif.

Lear, Inc., 3171 South Bundy Dr., Santa Monica, Calif.
Electronic & mechanical aircraft accessories; aircraft radio equipment, radio compasses, etc.

Lectrohm, Inc., 5560 Northwest Highway, Chicago 30, Ill.

Lectronic Research Labs., 715 Arch St., Philadelphia 6, Pa.
Electrical and electronic components; motors; cathode-ray tubes

Ledeen Mfg. Co., 1600 S. San Pedro St., Los Angeles 15, Calif.
Automatic control valves

Lee Spring Co., Inc., 30 Main St., Brooklyn 1, N. Y.
Solenoids

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia 44, Pa.
Electrical measuring instruments for both laboratory & plant. Speedomax Recorders Centrimax Flowmeters & Metermax Combustion control Systems

Leighton Labs., H. W., Sunset Lane & Mill Rd., Hatboro, Pa.
Geiger-Mueller tubes; health-monitoring chambers

Leiman Bros., Inc., 191 Christie St., Newark 5, N. J.
High-vacuum pumps

Leitz Inc., E., 468 Fourth Ave., New York, N. Y.
Optical instruments

Leland Inc., G. H., 123 Webster St., Dayton 2, Ohio
Circuit selector switches, stepping relays, rotary solenoids

Lenkurt Electric Co., 1105 County Road, San Carlos, Calif.
Ultrasonic-frequency transformers, metallic dust cored: inductors, electric wave filters

P. M. Lennard & Co., Inc., 671 Bergen St., Brooklyn 17, N. Y.
Test chambers; autoclaves; instrument cleaning equipment

Lenox Instrument Co., 2010 Chancellor St., Philadelphia 3, Pa.
Optical and technical instruments

Lepel High Frequency Labs., Inc., 55th St. & 37th Ave., Woodside 77, N. Y.
Laboratory furnaces; high-frequency apparatus

Leslie Co., Grant Ave. and Val Brook Ave., Lyndhurst, N. J.
Pressure reducing valves, pump governors, temperature regulators

Lessells & Associates, Inc., 916 Commonwealth Ave., Boston 15, Mass.
Testing instruments and machines; power supplies; components

Leupold & Stevens Instruments, 4445 N. E. Glisan St., P. O. Box 5082, Portland 13, Ore.
Recorders & indicators, for irrigation, power, waterworks, sewerage, Equipment for hydraulic laboratories. Snow-rain recorders, hydrographic accessories, transits, levels

Levin & Son, Louis, 3610 South Broadway, Los Angeles 7, Calif.
Instrument lathes

Levinthal Electronic Products, Inc., 2821 Fair Oaks Ave., Redwood City, Calif.
Automatic control systems and components; radio and radar instrumentation

Lewis & Co., J. B., 3324 Main St., Hartford 5, Conn.
Motor controls, adjustable speed-electronic exciters

Lewis Engineering Co., 52 Rubber Ave., Naugatuck, Conn.
Portable pyrometers, potentiometers, resistance thermometers & other electrical temperature measuring devices
(See advertisement on Back Cover)

Lewis & Kaufman, Ltd., P. O. Box 337, Los Gatos, Calif.
Electron tubes

Lewyt Corp., 60 Broadway, Brooklyn 11, N. Y.
Instrument housings

Librascope Inc., 808 Western Ave., Glendale 1, Calif.
Mechanical and electrical computers and analyzers, magnetic instruments
(See advertisement on page 33)

Liebel-Flarsheim Co., 111 East Amity Rd., Cincinnati 15, Ohio
Automatic time control equipment

Lindberg Air & Hydraulic Div., 225 N. Laflin St., Chicago 7, Ill.
Laboratory furnaces and controls

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.
Gas gages, gas flowmeters, oxygen regulators

Lindly & Co., 248 Herricks Rd., Mineola, L. I., N. Y.
Optical components, illuminators

Linear Equipment Labs., 380 Oak St., Copiague, N. Y.
Signal generators; baluns; h-v. and h-f. probes and components

Link Aviation Inc., Binghamton, N. Y.
Aircraft navigational instruments

Link Engineering & Mfg. Co., 13845 Elmira St., Detroit 27, Mich.
Spring testers

Liquidepth Indicators, Inc., 43-22 10 St., Long Island City 1, N. Y.
Level gages
(See advertisement on page 44)

Liquidometer Corp., 36-16 Skillman Ave., Long Island City 1, N. Y.
Liquid level gages

Liquid Scale Gauge Co., 100 N. First St., Minneapolis 1, Minn.
Liquid level indicating gages

Liquidvision Gauge & Control Corp., P. O. Box 51, Oceanside, L. I., N. Y.
Level measurement and control equipment

Liston-Becker Instrument Co., Inc., 649 Hope St., Springdale, Conn.
Gas analyzers, amplifiers
(See advertisement on page 78)

Littelfuse Inc., 1865 Miner St., Des Plaines, Ill.
Low amperage precision fuses & fuse mountings
(See advertisement on page 122)

Little, Inc., Arthur D., Memorial Drive, Cambridge 42, Mass.
Chemical feeds and special equipment

Little Falls Alloys Co., Inc., 181 Caldwell Ave., Paterson, N. J.
Special, non-ferrous, spring, and electric and electronic wire

Littleford Bros., 453 E. Pearl St., Cincinnati 2, Ohio
Control boards and housings

L and L Manufacturing Co., 136 Eighth St., Chester, Pa.
Electric furnaces

L & O Research & Development Corp., 134 N. Wayne Ave., Wayne, Pa.
Electrical and electronic instruments

Logan Engineering Co., Aridifier Div., 4901 W. Lawrence Ave., Chicago 30, Ill.
Compressed air and gas separators

Logeman Co., C. W., 633 Bergen St., Brooklyn 38, N. Y.
Metering and proportioning pumps; homogenizers

Logistics Research Co., 141 So. Pacific Ave., P. O. Box 431, Redondo Beach, Calif.
Automatic digital graph plotters and followers; photoelectric controls

Lonergan Co., J. E., 205 Race St., Philadelphia 6, Pa.
Pressure gages

Loral Electronics Corp., 794 E. 140th St., New York 54, N. Y.
Remote and machine control equipment; digital computers

Lord Mfg. Co., 1635 W. 12 St., Erie 6, Pa.
Bonded rubber vibration isolation mountings & flexible couplings for practical horsepower motors

Los Angeles Scientific Inst. Co., 2451 Riverside Dr., Los Angeles 39, Calif.
Planimeters; integrators; collimators; pantographs; optical testing instruments
(See advertisement on page 170)

Loudon Instr. Div., See Land-Air, Inc.

L & R Manufacturing Co., 577 Elm St., Arlington, N. J.
Instrument cleaning machines & cleaning & rinsing solutions. Crystal cement. Fractional-horsepower motors.

Lucifer Electric Furnaces, Inc., Neshaminy, Pa.
Furnaces and ovens

Ludwig Assoc., F. G., Coulter Rd., Old Saybrook, Conn.
Photocopying machines

Lufkin Rule Co., 1730 Hess Ave., Saginaw, Mich.
Precision tools & measuring tapes

Lumenite Electronic Co., 407 S. Dearborn St., Chicago 5, Ill.
Photoelectric controls

Lux Clock Mfg. Co., 95 Johnson St., Waterbury 20, Conn.
Automatic timers & clock mechanisms

Lyman Electronic Corp., 12 Cass St., Springfield, Mass.
Radio test instruments

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Macalaster Bicknell Co., 243 Broadway, Cambridge 39, Mass.
Laboratory glass apparatus

Macbeth Corp., P. O. Box 950, Newburgh, N. Y.
Hydrogen ion meters

Macbeth Daylighting Corp., 227 West 17 St., New York 11, N. Y.
Daylight lamps for titration & color matching

MacDonald Co., Inc., W. S. 33 University Road, Cambridge 38, Mass.
Microammeters, bolometers and magnetometers

Machinery Electrification, Northboro, Mass.
Remote and machine tool control systems; graphic panels

Machlett Laboratories, Inc., Springdale, Conn.
Vacuum tubes

Machlett & Son, E., 220 East 23rd St., New York 10, N. Y.
Laboratory apparatus & supplies

Mack Electric Devices Co., #38 Glenside Ave., Wyncote, Pa.
Relays; vacuum switches; temperature alarms
(See advertisement on page 191)

MacLeod & Hancpol, Chelsea & Joiner St., Charlestown 29, Mass.
Radio testing instruments

Mag Electric Products, Inc., 14405 S. Grenshaw Blvd., Gardena, Calif.
Electric control systems; magnetic amplifiers; power supplies; frequency regulators

Magnaflux Corp., 7300 W. Laurence Ave., Chicago 31, Ill.
Magnetic inspection equipment

Magnatrol Valve Corp., 67 Fifth Ave., Hawthorne, N. J.
Control valves
(See advertisement on page 234)

Magnavox Co., Inc., 2131 Bueter Rd., Fort Wayne 4, Indiana
Electrolytic capacitors

Magnecord Inc., 1101 S. Kilbourn Ave., Chicago 24, Ill.
Magnetic tape recorders

Magnecraft Electric Co., 1442 West Van Buren St., Chicago 7, Ill.
Relays

Magnetic Amplifiers Inc., 632 Tinton Ave., New York 55, N. Y.
Telemetering components, magnetic tape recorders

Magnetic Analysis Corp., 42-44 12th St., Long Island City 1, N. Y.
Magnetic inspectors for uniform cross-sectional steel
(See advertisement on page 137)

Magnetic Industries, Inc., 2640 Huldy St., Houston, Texas
Magnetic amplifiers; servomechanisms

Magnetic Instrument Co., 82 Main Street, West Orange, N. J.
Electrical measurement and control equipment; components

Magnetic Research Corp., 202 Center St., El Segundo, Calif.
Electrical and magnetic instruments; voltage regulators; magnetic amplifiers; reference standards; power supplies; components

Magnetics, Inc., Butler, Pa.
Computer memory cores

Magnetrol, Inc., 2110 S. Marshall Blvd., Chicago 23, Ill.
Flow and level controls
(See advertisement on page 104)

Maguire Industries, See Thordarson-Meissner

Mahady Co., E. F., 857 Boylston St., Boston 16, Mass.
Laboratory supply house

Malco Tool & Mfg. Co., 4025 West Lake Street, Chicago 24, Ill.
Instrument and electronic hardware

Mallory & Co., Inc., P. R., 3029 E. Washington St., Indianapolis 6, Ind.
Capacitors, switches

Mann Co., Wm. I., 116 W. Foothill Blvd., Monrovia, Calif.
Astronomical instruments, optical flats and components, laboratory apparatus and test equipment
(See advertisement on page 160)

Manning, Maxwell & Moore, Inc., 250 E. Main St., Stratford, Conn.
Thermometers, glass, dial & recording; controllographs; indicating & recording controllers; diaphragm motor valves; tachometers, barometers & hygrometers

Mansfield & Green, 1051 Power Ave., Cleveland 14, Ohio
Gages and dead weight testers
(See advertisement on page 201)

Manson Laboratories, 207 Greenwich Ave., Stamford, Conn.
Mass spectrographs; electrical and electronic testing instruments; power supplies

Manufacturers Engrg. & Equipment Corp., 10 Mill Road, Hatboro, Penna.
Gas and optical densitometers

Marble-Card Electric Co., Gladstone, Mich.
Fractional H P motors

Marchant Research Inc., 1475 Powell St., Emeryville, Calif.
Digital computers

Marco Industries Inc., Depew, N. Y.
Instrument and servomechanism motors

Marconi Instruments Ltd., 23 Beaver St., New York 4, N. Y.
Electrical and electronic instruments, frequency standards, amplifiers

Marine Compass Co., Pembroke, Mass.
Marine instruments

Marion Electrical Instrument Co., 400 Canal St., Manchester, N. H.
Electrical indicating instruments

Maris Co., John M., 2100 Arch St., Philadelphia 2, Pa.
Laboratory apparatus

Markite Corporation, 155 Waverly Place, New York 14, N. Y.
Voltage dividers; attenuators

Marks Polarized Corp., 153-16 10th Ave., Whitestone, L. I., N. Y.
Optical components and materials
(See advertisement on page 163)

Marsh Corp., Jas. P., 3501 Howard St., Skokie, Ill.
Indicating gages, recording gages, dial thermometers, recording thermometers, refrigeration service instruments, temperature controlling systems, valves for heating systems

Marshall Co., C. & E., 1445 West Jackson Blvd., Chicago 80, Ill.
Manufacturers & distributors of jewelers, watchmakers & engravers supplies

Marshall Co., L. H., 270 W. Lane Ave., Columbus, Ohio
Laboratory furnaces and foundry thermocouples

Marshall Instruments, Inc., 6859 Tujunga Ave., No. Hollywood, Calif.
Thermometers; test wells
(See advertisement on page 221)

Marshalltown Mfg. Co., Marshalltown, Iowa
Pressure gages & indicating thermometers
(See advertisement on page 127)

Martin & Co., H. S., 1916 Greenleaf St., Evanston, Ill.
Laboratory apparatus; glass and quartz components; voltage regulators

Martin-Hubbard Corp., 8 Hilliard St., Cambridge 38, Mass.
Designers of electrical, mechanical and optical instruments

Martindale Electric Co., Box 617 Edgewater Branch, Cleveland 7, Ohio

Marx Co., Clarence J., P. O. Box 4033, Cleveland 23, Ohio
Speed measuring instruments

Masco Products Co., 2119 Sepulveda Blvd., Los Angeles 25, Calif.
Automatic timers; military instruments

Mason Instrument Co., 29 Elm Ave., Mt. Vernon, N. Y.
Optical pyrometers

Mason-Neilan Regulator Co., 1190 Adams St., Boston 24, Mass.
Industrial control equipment for pressure temperature, flow, liquid level, combustion & ratio, diaphragm control valves; pressure & vacuum regulators; level controllers; pump speed governors; pump pressure regulators; pipe strainers
(See advertisement on page 53)

Mass Instruments, 84-51 Beverly Rd., Kew Gardens 15, L. I., N. Y.
Photoelectric colorimeters, photometers

Massa Laboratories Inc., 5 Fottler Rd., Hingham, Mass.
Acoustic instruments, sound pressure measurement standards

Matisa Equipment Corp., 224 S. Michigan Ave., Chicago 4, Ill.
Aircraft instruments; process measurement and control instruments

Matthews Instrument Co., 1350 Burlington Ave., Bristol, Conn.
Odometers

Maurer, Inc., J. A., 37-01 31 St., Long Island City, 1, N. Y.
Motion picture cameras

Maveg Machine Sales Association, Chamber of Commerce Bldg., Long Island City, N. Y.
Dilatometers, dual comparators

Maxson Corp., W. L., 460 West 34 St., New York 1, N. Y.
Aircraft instruments, computing machines, integrators gyro stabilizers, aircraft and naval current controls

Maxson Instrument Div. of W. L. Maxson Corp., 47-37 Austelle Place, Long Island City I, N. Y.
(See advertisement on page 10)

Maymer Corp., 1961 West 112th St., Cleveland 2, Ohio
Scales, dials & templates

M B Mfg. Co., Inc., 1060 State St., New Haven 11, Conn.
Electrical instruments

McAlear Manufacturing Co., 1901 S. Western Ave., Chicago 8, Ill.
Manual & automatic controls for air, oil, gas, steam, chemicals, pure food, acid & alkali

McColpin-Christie Corp., Ltd., 3410 West 67th St., P. O. Box 19665, Los Angeles 43, Calif.
Power supplies; rectifiers; battery chargers and testers

McCoy Electronics Co., Mt. Holly Springs, Pa.
Crystals; crystal ovens; capacitors

McDanel Refractory Porcelain Co., 510 Ninth Avenue, Beaver Falls, Pa.
Porcelain insulators, components; pyrometers

McDonnell Odometers Co., 3501 So. Kedzie Ave., Chicago 32, Ill.
Counters

McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.
Boiler controls; level measurement and control equipment; valves

McFarlin Co., 29 West Marion Ave., Youngstown 2, Ohio
Leak detectors

McKenna Labs., 2503 Main St., Santa Monica, Calif.

McKesson & Robbins, Inc., 1706 First Ave., Birmingham 3, Ala.
Laboratory Supplies

McNeill Engineering Co., S. J., 4057 West Van Buren St., Chicago 24, Ill.
Smoke alarms

McRae Corp., 750 North Glendale Ave., Glendale, Calif.
Valves and valve-operating devices

McShan Development Corp., 71 Murray St., New York 7, N. Y.
Audio frequency standards; filters; components

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Control valves

Measurements Corp., Boonton, N. I.
Radio frequency Testing & Measuring Devices
(See advertisement on page 41)

Mechanical Industries Production Co., 217 Ash St., Akron 3, Ohio
Thermostats

Mechanical Products Corp., 168 N. Ogden Ave., Chicago 7, Ill.
Metering pumps; automatic dispensers

Mega Research, P. O. Box 371, Dover, N. J.
Computers; integrators; voltage regulators

Meletron Corp., 950 N. Highlad Ave., Los Angeles 38, Calif.
Pressure operated switches

Menlo Research Lab., P. O. Box 522, Menlo Park, Calif.
Nucleonic and ultraviolet instrumentation and components; grain testers

Mepco Inc., 37 Abbett Ave., Morristown, N. J.
Standard and special resistors

Mercoid Corp., 4201 Belmont Ave., Chicago 41, Ill.
Automatic controls for heating, refrigeration, air conditioning & various industrial applications

Mercon Regulator Co., 2357 N. 29th St., Milwaukee 10, Wis.
Power plant specialties in regulation of pressure, level, rate of flow, proportioning & temperature

Mercury Contacts, Inc., P. O. Box 615, Far Hills Station, Dayton 9, Ohio
Relays and switches

Mercury Glass Co., Pleasantville, N.J.
Glass tubing

Meriam Instrument Co., 10920 Madison Ave., Cleveland 2, Ohio
Manometers, draft gages, indicating flow meters for steam, oil, gas, air, water, tank liquid level gages
(See advertisements on pages 118, 143)

Merit Transformer Corp., 4427 N. Clark St., Chicago, Ill.
Transformers, coils & reactors, electrical windings

Merkle Korff Gear Co., 213 North Morgan St., Chicago 7, Ill.
Motorized speed reducers· induction, synchronous, reversing, d-c universal motors

Merrick Scale Mfg. Co., 180-186 Autumn St., Passaic, N. J.
Automatic continuous weighing machines

Merritt Engg. & Sales Co., Inc., 120 So. Niagara St., Lockport, N. Y.
Consistency controls

Merz Engineering Inc., 200 S. Harding St., Indianapolis 7, Ind.
Gages & gaging fixtures

Metal Goods Corp., 5239 Brown Ave., St. Louis 15, Mo.
Tube fittings

Metalab Equipment Corp., 270 Duffy Ave., Hicksville, L. I., N. Y.
Laboratory furniture

Metalphoto Corp., 2903 E. 79th St., Cleveland 4, Ohio
Photosensitive anodized aluminum plates; dial faces; fluorescent chemicals

Meters, Incorporated, 5353 N. Keystone Ave., Indianapolis 20, Ind.
Electrical indicating instruments

Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.
High frequency amplifiers, electric instruments, oscillators, radio remote control systems, comparator gages electric tachometers, timers, chronographs

Metrotype Corp., 6100 Archer Road, Summit, Ill.
Frequency regulators, recording ammeters, remote reading equipment, counters

Metzger & Son., F. F., 2600 N. 6 St., Philadelphia 33, Pa.
Extensometers and gages

Meyer Scientific Supply Co., Inc., 221 Atlantic Ave. Brooklyn 2, N. Y.
Laboratory apparatus

Meyer Governor Co., 284 Baker Bldg., Minneapolis 2, Minn.
Long-distance recording, indicating, and contact-making instruments; gage pulsation protectors

Hugo Meyer & Co., 39 West 60th St., New York 23, N. Y.
Optical instruments and their mechanical and optical components; electrical instruments; paper testers

M and G Instrument Co., 12940 Saticoy St., N. Hollywood, Calif.
Micrometers, dial indicators

Michigan Electronics, Inc., 854 No. Rockwell St., Chicago 22, Ill
Tape recorders; components

Mico Instrument Co., 80 Trowbridge St., Cambridge, Mass.
Precision devices in industrial & scientific fields
(See advertisement on page 115)

Microchemical Service, 44-27 Dougleston Pkway., Douglaston, N. Y.
Microchemical laboratory apparatus

Microchemical Specialties Co., 1834 University Ave., Berkeley 3, Calif.
Laboratory apparatus; components

Micro Balancing, Inc., 191 Herricks Road, Garden City Park, L. I. 14, N. Y.
Automatic balancing machines; photoelectric controls

Micro-Circuits Co., New Buffalo, Mich.
Printed circuits; resistors; temperature-sensitive resistors; conductive coatings; magnetic paints

Micro Master Co., 2733 N. Pulaski Rd., Chicago 39, Ill.
Dial indicators & taper gages

Micro Metallic Corp., 30 Sea Cliff Ave., Glen Cove, N. Y.
Pressure snubbers

Micro Metric Instrument Co., 21509 McCracken Rd., Box 884, Cleveland 22, Ohio
Chemical and biological instruments

Micro-Poise Engg. & Sales Co., 14851 Grand River Ave., Detroit 27, Mich.
Balancing machines

Micro Switch Div., Minneapolis-Honeywell Regulator Co., Spring Street, Freeport, Illinois
Snap action switches

Micromax Co., 1964 Utica Ave., Brooklyn 34, N. Y.
Voltage-dividing resistors

Micrometrical Manufacturing Co., 345 S. Main St., Ann Arbor, Mich.
Surface finish gages; bearing testers

Microtran Company, 84-11 Rockaway Beach Blvd., Rockaway Beach 93, N. Y.
Vibration instrumentation; transformers

Microtime Laboratories, 7247 Atoll Ave., N. Hollywood, Calif.
Power supplies; x-ray equipment; Kerr cells
(See advertisement on page 177)

Microwave Assocs., Inc., 22 Cummington St., Boston 15, Mass.
Microwave instruments

Mid-Century Instrumatic Corp., 611 Broadway, New York 12, N. Y.
Electronic computers; multipliers; recording oscillographs

Midwestern Instruments, 3401 So. Harvard, Tulsa, Okla.
Geophysical instruments, amplifiers, galvanometers
(See advertisement on page 7)

Mid-West Dynamometer & Engg. Co., 3100 River Road, River Grove, Ill.
Dynamometers

Mikron Instruments, Inc., 1966 E. Walnut St., Pasadena, Calif.
Surveying instruments; optical instruments; prisms; mirrors; lenses

Mil Instrument Corp., 92-15 172nd St., Jamaica, L. I., N. Y.
Electrical indicating instruments; galvanometers

Millen Mfg. Co., James, 150 Exchange St., Malden, Mass.
Radio test instruments

Miller Dial and Name Plate Co., 4400 N. Temple City Blvd., El Monte, Calif.
Standard, fluorescent and radioactive components and chemicals
(See advertisement on page 113)

Miller-Harris Instrument Co., 601 E. Ogden Ave., Milwaukee 2, Wis.
Automatic time controllers; switches

Miller Corp., Wm., 325 N. Halstead Ave., Pasadena 8, Calif.
Vibration pickups; oscillographs; inspection devices; geophysical apparatus; power supplies

Miller, M. C. Box 66, Route 2, Allendale, N. J.
Electrical instruments

Miller-Robinson Co., 7007 Avalon Blvd., Los Angeles, Calif.
Pressure instruments; high-frequency apparatus; switches

Miller & Sons, R. F., Harvard, Nebr.
Fault-locating instruments
(See advertisement on page 116)

Millers Falls Co., Greenfield, Mass.
Machine shop gages

Millivac Instruments Corp., 444 Second St., P. O. Box 997, Schenectady 6, N. Y.
Special electronic instruments

Milo Radio & Electronics Corp., 200 Greenwich St., New York 7, N. Y.
Electronic parts & equipment distributor

Milton Roy Company, 1300 E. Mermaid Ave., Philadelphia 18, Pa.
Automatic feeders & flow controllers

Milwaukee Gas Specialty Co., P. O. Box 461, Milwaukee 1, Wis.
Valves, fittings & safety shut-offs for gas fired equipment
(See advertisement on page 191)

Minatron Corp., 3 Cliveden Place, Belle Meade, N. J.
Dimensional gages; motion pickups

Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Instruments for the detection, analysis & recording of toxic and combustible gases; instruments for sampling, counting & measuring dust particles
(See advertisement on page 16)

Mine & Smelter Supply Co., 1422-17th St., Denver, Colo.
Industrial equipment & supplies

Miniature Precision Bearings, Inc., Keene, N. H.
Instrument pivots and bearings

Minneapolis Elec. & Construction Co., 80 South 12th St., Minneapolis 4, Minn.
Wire length measuring machines

Minneapolis-Honeywell Reg. Co., Indus. Div., Wayne & Windrim Aves., Philadelphia 44, Pa.
Thermocouple & optical pyrometers, resistance thermometers, pressure thermometers, pressure gages, flow meters, liquid level gages, hygrometers, CO_2 meters, control systems; electric air-operated & combined electric & air-operated; combustion safety controls, moisture content recorder & controller & furnace atmosphere recorder

Minnesota Electronics Corp., 133 E. Santa Anita, Burbank, Calif.
Frequency and counting instruments; analog computers; electrical sets; transformers

Mira Scientific Instruments, 2656 N. Pasadena Ave., Los Angeles 31, Calif.
Gas analyzers; electrical and electronic instrumentation; components

Mitchell Camera Corp., 666 W. Harvard St., Glendale 4, Calif.
Scientific motion picture cameras; components

Mitchell Radiation Prods. Corp., P. O. Box 70, Morristown, Pa.
X-ray apparatus

Mitchell Scientific, 93 Mac Queston Pwky., No., Mt. Vernon, N. Y.
Collimators

Mixing Equipment Co., Inc., 135 Mt. Read Blvd., Rochester 11, N. Y.
Laboratory apparatus

Model Engineering & Mfg. Co., 2800 N. Milwaukee Ave., Chicago 18, Ill.
Resistors

Model Rectifier Corp., 557 Rogers Ave., Brooklyn 25, N. Y.

Modern Electrical Laboratory, 6131 S. Wentworth Ave., Chicago 21, Ill.
Laboratory apparatus

Modern Metalcraft, 1075 N. Eastman Rd., Midland, Mich.
Metering and proportioning pumps

Modev Co., 1825 Ravenwood Ave., Dayton, O.

Moeller Instrument Co., 132nd St. & 89th Ave., Richmond Hill, N. Y.
Thermometers, hydrometers, etc.
(See advertisement on page 43)

Mohawk Electronic Research Labs., R. D. 4, Amsterdam, N. Y.
Electrical and electronic instrumentation

Moisture Register Co., 1510 W. Chestnut St., Alhambra, Calif.
Moisture testing instruments & devices

Moline Furniture Works, Moline, Ill.
Laboratory furniture

Monarch Manufacturing Co., 2014 N. Major Ave., Chicago 39, Ill.
Radio set testers

Monroe Calculating Machine Co., Inc., 555 Mitchell St., Orange, N. J.
Digital computers; plug-in circuitry

Monsell, J. R., Pitman, N. J.
Dynamometers

Montgomery Mfg. Co., 202-204 Main St. Owensville, Ind.
Program clocks

Moog Valve Co., Inc., E. Aurora, N. Y.
Automatic control systems and components

Moore Company, H. R., 200 W. Montgomery Ave., Hatboro, Pa.
Paint and film testing instruments: viscosimeters

Moore Corporation, John B., Peerless Bldg., P. O. Box 3, Nutley 10, N. J.
Instrument cleaning compounds

Moore & Co., Samuel, Mantua, Ohio
Polyethylene or vinal plastic coatings for instrument tubing
(See advertisement on page 45)

Moore Products Co., 901 E. Lycoming St., Philadelphia 24, Pa.
Industrial instruments

Moran Electronic Components, Inc., 10506 Wheatley St., Kensington, Md.
Power supplies; transformers

Morehouse Machine Co., 233 W. Market St., York, Pa.
Force measuring equipment
(See advertisement on page 88)

Morganite, Inc., 3302-3320 48th Ave., Long Island City 1, N. Y.
Pyrometer tubes

Moseley Co., Francis L., 409 N. Fair Oaks Ave., Pasadena 3, Calif.
Two-axis ("X-Y") recorders; control drives
(See advertisement on page 241)

Mosher Electronic Controls, 25 Boston Post Rd., Larchmont, N. Y.
Electronic bin level indicators & electronic load regulators for pulverizing machinery

Mossman, Inc., Donald P., P. O. Box 265, Brewster, N. Y.
Switches

Mt. Sopris Instrument Corp., 1320 Pearl St., Boulder, Colo.
Geophysical and nucleonic instruments

Mountain Syztems Inc., 864 Franklin Ave., Thornwood, N. J.
Digital computers; data handling systems and processing equipment

Mueller Electric Co., 1583 E. 31st St., Cleveland 14, Ohio
Electrical test clips; alligator clips; insulators; C ground clips
(See advertisement on page 100)

Mueller Laboratory, 239 W. Maple Ave., Monrovia, Calif.
Dimensional gages; magnetic counters

Mullen Tester Div., See Perkins and Son, Inc., B. F.

Multi-Amp Corp., 10 Third St., Newark, N. J.
Testing & calibration equipment

Municipal Instrument Co., 3246 S. Cuyler Ave., Berwyn, Ill.
Magnetic dipping needles, pipe phone for checking leaks

Munsell Color Co., Inc., 10 E. Franklin St., Baltimore 2, Md.
Color comparators

Murphy & Miller, Inc., 1332 So. Michigan Ave., Chicago 5, Ill.
Temperature, humidity and altitude test chambers
(See advertisement on page 94)

Mu-Switch Division of Acro Mfg. Co., 2040 E. Main St., Columbus, Ohio
Temperature and combustion controllers; snap switches

Myer Corp., Acra-ment Gage Div., 633 Park Ave., Cranston, R. I.
Dimensional gages and fixtures

N

Nalley Co., Leonard L., 833 W. Plum St., Compton 4, Calif.
Electric analog computers; complex-wave generators; fire-control instruments; amplifiers; power supplies

Nankervis Co., G. L., 19255 W. Davison, Detroit 23, Mich.
Dynamometers, inspection and gaging equipment

Narda Corp., 66 Main St., Mineola, N. Y.
Microwave and high-frequency equipment; thermistors

Nash Engineering Co., 370 Wilson Road, South Norwalk, Conn.
Instrument air compressors
(See advertisement on page 48)

Nashville Surgical Supply Co. 401 Church St., Nashville 3, Tenn.

National Appliance Co., 7634 S. W. Capitol Hwy., Portland 18, Ore.
Laboratory apparatus

National Brass Co., 1600 Madison St., S. E., Grand Rapids 2, Mich.
Combustion & draft controllers

National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.
Gear inspection and testing equipment

National Carbon Co., 30 E. 42 St., New York 17, N. Y.
Dry batteries

National Cash Register Co., Electronics Div., 3348 W. El Segundo Blvd., Hawthorne, Calif.
Computers

National Co., Inc., 61 Sherman St., Malden, Mass.
Capacitors and radio instruments

National Electric Controller Co., 7070 Glenwood Ave., Chicago 26, Ill.
Rheostats

National Electric Instrument Co., Inc., 92-21 Corona Ave., Elmhurst 73, N. Y.
Bore-inspection equipment; telescopes

National Engineering Products Inc., Washington Bldg., Washington 5, D. C.
Pressure gage equalizers

National Forge & Ordnance Co., Testing Machine Div., Irvine, Warren County, Pa.
Testing machines for materials and for finished products

National Instrument Co., 246 Walnut St., Newtonville 60, Mass.
Electro-mechanical instruments & devices

National Instrument Co., 2701 Rockwood, Baltimore 15, Md.
Automatic pipettes

National Instrument Labs., Inc., 6108 Rhode Is. Ave., Riverdale, Md.
Custom built instruments

National Pneumatic Co., Inc., 185 Amory St., Boston, Mass.

National Radiac, 10 Crawford St., Newark 2, N. J.

National Research Corp., 70 Memorial Drive, Cambridge 42, Mass.
Optical products, high vacuum apparatus

National Scientific Co., 2204 W. North Ave., Chicago 47, Ill.
Laboratory supply house

National Spectrographic Lab., 6300 Euclid Ave., Cleveland 3, Ohio
Spectrographs; spectroscopes; microdensitometers; testing devices

National Tel-Tronics Corp., 33 St. Casimir Ave., Yonkers, N. Y.
Dial lights; connectors, plugs, clips, etc.

National Time & Signal Corp., 21800 Wyoming Ave., Detroit 37, Mich.
Timers for welding & industrial process control

National Tool Co., 11200 Madison Ave., Cleveland, Ohio
Pocket optical comparators

Natural Gas Equipment, Inc., 804 South Fair Oaks Ave. Pasadena 2, Calif.
Automatic-control systems

Naxon Utilities Corp., 3600 W. Touhy Ave., Chicago 45, Ill.
Instrument cleaning machines

Negus, T. S. & J. D., 69 Pearl St., New York 4, N. Y.
Nautical instruments

Neider Fused Quartz Co., 90 Broad St., Babson Park Boston 57, Mass.
Optical flats; quartz apparatus and components

Neise, Karl A., 404 Fourth Ave., New York 16, N. Y.
Dimensional gaging equipment

Nelson Instrument Co., 607 Howard St., Evanston, Ill.
Custom designers and consultants for control equipment, systems, and installations

Nelson Section Liner Co., 229 W. Gardner St., DeKalb, Ill.
Drawing instruments

Nelson & Street, 11705 Highview Ave., Kensington, Md.
Chronographs, timers

Nemeth Laboratories, Inc., Otto R., 2223 S. Carmelina Ave., Los Angeles 64, Calif.
Electric counters

Neon Claude, Inc., 25 W. 43d St., New York, N. Y.
Transformers and electrical apparatus

Neptune Meter Co., 50 W. 50th St., New York 20, N. Y.
Liquid meters

Neptune Pump Mfg. Co., 4912 N. 6 St., Philadelphia 20, Pa.
Metering and proportioning pumps, chemical feeders

Nester Company, Inc., L. G., Millville, N. J.
Oxygen regulators
(See edvertisement on page 80)

Neucor, Inc., 45 W. Union St., Pasadena 1, Calif.

Neutronic Associates, 87-16 116th St., Richmond Hill 18, N. Y.
Power supplies
(See advertisement on page 177)

New England Laminates Co., Inc., 16 Dyke Lane, Stamford, Conn.
Metal-clad and unclad plastic laminates.
(See advertisement on page 134)

New Hampshire Ball Bearings Inc., 2 Main St., Peterborough, N. H.
Miniature ball bearings

New Haven Clock Co., 133 Hamilton St., New Haven 4, Conn.
Capacitors; clocks; timers

New Hermes, Inc., 13-19 University Place, New York 3, N. Y.
Engraving machines
(See advertisement on page 115)

N. J. Laboratory Supply Co., 235 Plane St., Newark, N. J.
Laboratory supplies

New Jersey Electronics Corp., 345 Carnegie Ave., Kenilworth, N. J.
Electrical and electronic instrumentation, power supplies

New Jersey Meter Co., Plainfield, N. J.
Compressed air meters, separators for removing water & oil from compressed air lines, liquid flow indicators with low flow signaling circuit

New London Instrument Co., Inc., 82 Union St., New London, Conn.
Electronic instruments; high-frequency instruments; signal generators

N. Y. Laboratory Supply Co., Inc., 76 Varick St., New York 13, N. Y.
Laboratory supplies

New York Scientific Supply Co., 28 West 30 Street, New York, N. Y.
Laboratory supplies

New York Transformer Co., Alpha, N. J.
Transformers

Newage International, Inc., 235 E. 42nd St., New York, N. Y.
Hardness testers

Newall Mfg. Co., 139 N. Wabash Ave., Chicago 2, Ill.
Precision tools; instrument tubing and lubricants

Newark Electric Co., 223 W. Madison St., Chicago 6, Ill.
Electrical and electronic instruments and supplies

Newark Scale Works, 10-12 Hobson St., Newark 8 N. J.
Scales

Newark Wire Cloth Co., 336 Verona Ave., Newark, N. J.
Testing sieves

Newmatic Corp., West Hartford, Conn.
Pressure and flow measurement and control instrumentation; timers; switches; laboratory presses

Niagara Electrical Instrument Co., 559 Ellicott St., Buffalo, N. Y.
Electrical power analyzer

Nife, Inc., Lambert Ave., Copiague, L. I., N. Y.
Optical instruments

Nilsson Gage Co., Inc., P. O. Box 505, Poughkeepsie, N. Y.
Dimensional gages

Non-Linear Systems, Del Mar Airport, Del Mar, Calif.
Electronic and electrical instruments; digital voltmeters
(See advertisement on page 237)

Norcross Corporation, 247 Newtonville Ave., Newton 58, Mass.
Humidity controllers and recording viscosimeters
(See advertisement on page 235)

Norden-Ketay Corp., 99 Park Ave., New York, N. Y.
Pressure and vacuum instrumentation; aircraft instrumentation; military instruments; electrical and electronic components

Norgren Co., C. A., 3400 S. Elati St., Englewood, Colo.

North American Instrument Co., 23 East 26 St., New York, N. Y.
Aircraft instruments

North American Instruments, Inc., 2420 N. Lake St., Altadena, Calif.
Remote-metering equipment; motion recorders; rain gages; fire-control and flight-test instruments

North American Philips Co., Inc., 750 S. Fulton Ave., Mt. Vernon, N. Y.
X-ray equipment

North Electric Mfg. Co., Box 417, Galion, Ohio
Remote & supervisory equipment; electronic components

Northeast Scientific Corp., 617 Concord Ave., Cambridge, Mass.
Microwave instrumentation

Northwest Instrument Co., 2313 Third Ave., Seattle 1, Wash.
Compasses

Norton Electrical Instrument Co., 83 Hilliard St., Manchester, Conn.
Electrical instruments

Nosker Engineering Products, 1216 Livermore St., Yellow Springs, Ohio
Strain measuring equipment

NRD Instrument Co., 6425 Etzel Ave., St. Louis 14, Mo.
Radioactivity instrumentation; liquid level and mechanical control equipment

Nuclear-Chicago (Nuclear Instr. and Chem. Corp.) 229 W. Erie St., Chicago 10, Ill.
Radioactivity instrumentation
(See advertisement on page 159)

Nuclear Development Laboratory, P. O. Box 7034, Kansas City, Mo.
Radium detectors

Nuclear Measurements Corp., 2460 N. Arlington Ave., Indianapolis 44, Ind.
Nuclear instrumentation

Nuclear Products Co., 10173 E. Rush, El Monte, Calif.
Static eliminating devices

Nuclear Research Corp., Southampton, Pa.
Radioactivity instrumentation; process measurement and control equipment

Nuclear Science & Engineering Corp., P. O. Box 10901, Pittsburgh 36, Pa.
Radioactivity instruments; level indicators

Nucleonic Co. of America, 196 Degraw St., Brooklyn, N. Y.
Radiation detectors

Nurnberg Thermometer Co., Inc., 124 Livingston St., Brooklyn 2, N. Y.
Thermometers and hydrometers

Nye, Inc., Wm. F., Box 927, New Bedford, Mass.
Instrument and watch oils

O

Oak Mfg. Co., 1250 Clybourn Ave., Chicago 10, Ill.
Radio and television parts

Offner Electronics, Inc., 5320 N. Kedzie Ave., Chicago 25, Ill.
Oscillographs

Ohaus Scale Corp., 1050 Commerce Ave., Union, N. J.
Analytical balances

Ohmart Corp., The, 2236 Bogen St., Cincinnati 14, Ohio
Instruments using radioactivity principle for measuring processing and operating conditions

Ohmite Mfg. Co., 3601 Howard St., Skokie, Ill.
Close control rheostats, fixed & adjustable power resistors, precision & non-inductive resistors, attenuators, tap switches and R. F. chokes.

Oil Well Water Locating Co., 2230 Lemon Ave., Long Beach 6, Calif.
Oil well instrumentation; automatic controllers

Okonite Co., The, Passaic, N. J.
Air and hydraulic tubing; friction and rubber tapes, electric wires, cords and cables

Olsen Testing Machine Co. Tinius, Easton Road, Willow Grove, Pa.
Testing machines

Olympic Development Co., 30 Commerce Rd., Stamford, Conn.
Scientific and industrial instruments

Olympic Metal Products Co., Inc., P. O. Box 71, Phillipsburg, N. J.
Instrument housings

Omega Machine Co., 345 Harris St., Providence, R. I.
Chemical feeding equipment for dry or liquid materials, by volume or by weight

Opad Electric Co., 69 Murray St., New York 7, N. Y.
Power supplies; electrical and electronic test instruments; components
(See advertisement on page 176)

Opplem Co., Inc., 83 Uhland St., E. Rutherford, N. J.
Optical instruments and components; electrical and mechanical testing and measuring instruments

Optical Coating Lab., Inc., 1035 Sebastopol Rd., Santa Rosa, Calif.
Low-reflecting surface glass, lenses, mirrors

Optical Development Corp., 949 Broadway, New York 10, N. Y.
Magnifiers, microscope accessories

Optical Film Engineering Co., 2731 N. Sixth St., Philadelphia 33, Pa.
Vacuum pumps; optical parts.

Optical Gaging Products, Inc., 26 Forbes St., Rochester 11, N. Y.
Dimensional gaging and inspection equipment

Optionic Research, Inc., 2400 Massachusetts Ave., Cambridge 40, Mass.
Biological instruments

Optron Laboratory, 2725 Salem Ave., Dayton 6, Ohio
Optical flats reflectors prisms
(See advertisement on page 150)

OPW Corp., 2735 Colerain Ave., Cincinnati 25, Ohio

Orchem Pump Div., Orlich Bros. Machine Works 4434-36 Salmon St., Philadelphia 37, Pa.

Oregon Electronics, 2232 E. Burnside Ave., Portland 15, Oregon
Regulated power supplies

Orton Ceramic Foundation, Edward, Jr., 1445 Summit St., Columbus 1, Ohio
Pyrometric cones

Osborne Electric Co., 712 S. E. Hawthorne Blvd., Portland, Oregon
Electrical components

Oster Mfg. Co., John, 309 W. Fairmount Ave., Milwaukee 11, Wis.
Fractional horsepower motors

Overload Control Co., 2601 Langston Ave., Glen Oaks, L. I. 14, N. Y.

Owen Laboratories, 412 Woodward Blvd., Pasadena 10, Calif.
Oscilloscope sweep calibrators; transistor testers; amplifiers; power supplies
(See advertisement on page 219)

Owens Illinois Glass Co., Ohio Building, Toledo 4, Ohio
Scientific and industrial instrument and glass components; special materials

P

Pace Electrical Instruments Co., Inc., 70-31 84th St., Glendale 27, L. I., N. Y.
Electrical indicating instruments

Pacific Div., see Bendix Aviation Corp.

Pacific Instrument Co., 3226 Randolph Ave., Oakland 2, Calif.
Electrical and electronic test instruments; components

Pacific Optical Corp., 6145 West Century Blvd., Los Angeles 45, Calif.
Glass and plastic lenses

Pacific Scientific Co., Inc., 1430 Grande Vista Ave., Los Angeles 23, Calif.
Cable tension indicator

Pacific Semiconductors, Inc., 11920 W. Jefferson Blvd., Culver City, Calif.
Transistors; diodes

Pacific Transducer Corp., 11838 W. Pico Blvd., Los Angeles 64, Calif.
Microscopes and accessories; electrical instruments and components; ultra-violet lamps
(See advertisement on page 140)

Pacific Universal Products Co., 163 N. Vista Ave., Pasadena 8, Calif.
Lenses and mirrors
(See advertisement on page 160)

Pak-Rapid, Inc., 530 N. 21st St., Philadelphia 30, Pa.
Automatic packaging machines.
(See advertisement on page 138)

Palmer Thermometers, Inc., 2501 Norwood Ave., Cincinnati 12, Ohio
Industrial indicating "Red-Reading-mercury" thermometers, dial thermometers, recording thermometers
(See advertisement on page 19)

Palo Laboratory Supplies, Inc., 81 Reade St., New York 7, N. Y.
Paper testing machines; laboratory supplies

Palo-Myers Inc., See Palo Lab. Supplies, Inc.

Panalarm Products, Inc., 6312 N. Broadway, Chicago 40, Ill.
Annunciator and alarm systems; liquid level indicators and recorders; relays
(See advertisement on page 76)

Panascan, Inc., 6312 N. Broadway, Chicago 40, Ill.
Process scanning and monitoring systems

Panero Mirrors Inc., 2958 Los Feliz Blvd., Los Angeles, 39, Calif.
Mirrors, high vacuum coatings
(See advertisement on page 150)

Panellit,® Inc., 7401 N. Hamlin Ave., Skokie, Ill.
Instrument panels, pressure indicators
(See advertisement on pages 109, 166)

Panoramic Radio Products Corp., 10 S. Second Ave. Mt. Vernon, N. Y.
Electronic instruments and inspection devices

Pan-Technics, Ltd., 470 First St., Encinitas, Calif.
Front surface mirrors

Para Laboratory Supply Co., 221 N. Hermitage Ave., Trenton 8, N. J.
Laboratory supply house

Paragon Electric Co., 1600—12th St., Two Rivers, Milwaukee, Wis.
Timers

Park Sales Co., 421 Canal St. New York 13, N. Y.
Micrometers and calipers

Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio
Pressure snubbers, valves, fittings for instrument tubing

Par-Metal Products Corp., 32-62 49th St., Long Island City, N. Y.
Racks, panels, consoles

Parr Instrument Co., 211-53 St., Moline, Ill.
Combustion bombs, calorimeters, hydrogenation apparatus, melting point apparatus

Parr Manufacturing Corp., 44 Austin St., Newark 5, N. J.
Electrical ground detectors; fault locators

Partlow Corp., 2 Campion Rd., New Hartford, N. Y.
Temperature indicators & controllers, time delay relays

Pasadena Hydraulics, Inc., 279 N. Hill Ave., Pasadena 4, Calif.
Lab and factory presses

Passaic Analytical Laboratories, Inc., Passaic Ave., Caldwell, N. J.
Instrument cleaning machines

Patent Button Co., Patwin Instruments Div., Waterbury 20, Conn.
Chemical analyzers, polarographic analyzers, flame photometers, indicating potentiometers

Patterson Screen Div., E. I. duPont de Nemours & Co., Towanda, Pa.
X-ray intensifying and fluorscopic screens

Paul & Stein Bros., Inc., F. H., 235 Fifth Ave., New York 16, N. Y.
Electrical and electronic components

Paul Valve Co., 683 Third Ave., New York 17, N. Y.

Paulstick & Sons, H. 2124 Fulton St., Brooklyn 33, N. Y.
Thermometers

PCA Electronics Inc., 2180 Colorado Ave., Santa Monica, Calif.
Transformers; capacitors; delay lines; h-f. components
(See advertisement on pages 110, 183)

Peerless Electric Co., 1401 W. Market St., Warren, Ohio
Thermocouple restorers; fractional h-p. motors

Pelouze Mfg. Co., 1218 Chicago Ave., Evanston, Ill.
Torque gages

Penberthy Injector Co., Div. Buffalo-Eclipse Corp., 1242 Holden Ave., Detroit 2, Mich.
Pressure and level gages and automatic controllers; UV-transmitting glass

Penberthy Instrument Co., 666 Adams St., Seattle 8, Wash.
Industrial and smoke periscopes

Penn Industrial Instrument Division, 4110 Haverford Ave., Philadelphia 4, Pa.
Flowmeters; process instrumentation

Penn Optical & Inst. Co., 19542 Bristol St., Costa Mesa, Calif.
Optical parts
(See advertisement on page 85)

Penna. Pump & Compressor Co., Easton, Pa.
Instrument-air compressors

Perfex Controls Div., General Controls Co., Iron Mountain, Mich.
Automatic temperature controls for oil burners, stokers, gas burners, refrigeration & air conditioning

Perkin-Elmer Corp., P. O. Box 730, Norwalk, Conn.
Optical instruments

Perkin Engineering Co., 345 Kansas St., El Segundo, Calif.
Regulated power supplies; battery chargers
(See advertisement on page 1)

Perkins & Son, Inc., B. F., Mullen Tester Div., P. O. Box 388, Holyoke, Mass.
Testers for leather, paper & textiles
(See advertisement on page 212)

Permag Corp., 214 Taaffe Place, Brooklyn 5, N. Y.
Permanent magnets
(See advertisement on page 142)

Permo Incorporated, 6415 N. Ravenswood Ave., Chicago 26, Ill.
Instrument pivots & contacts

Permutit Company, 330 West 42nd St., New York 18, N. Y.
Indicators & recorders for CO_2, specific gravity of natural manufactured or process gases, exhaust gas analysis, other uses where gas density guides operation

Peschel Electronics, Inc., 13 Garden St., New Rochelle, N. Y.
Electrical and electronic testing equipment, power supplies and automatic regulators
(See advertisement on page 213)

Pesco Products Co., 24700 North Miles Rd., Bedford, Ohio
Fractional h-p. and geared motors; pumps

Peterson & Co., Inc., Leonard, 1222 Fullerton St., Chicago 14, Ill.
Laboratory furniture

Petrometer Corp., 1 Star Square, Long Island City 1 N. Y.
Distant reading, liquid level tank gages

Pfaltz & Bauer, Inc., 350 5th Ave., New York 1, N. Y.
Laboratory control instruments

Pfaudler Co., 1000 West Ave., Rochester 3, N. Y.

Phaostron Co., 151 Pasadena Ave., So. Pasadena, Calif.
Electrical and electronic measuring instruments; relays and other components

Phebco Inc., 3640 Woodland Ave., Baltimore 15, Md.
Electrical and electronic instruments

Phen-Trols, Inc., 1 Circle Lane, Rutherford, N. J.
Pyrometers, thermocouples, instrument and regulating transformers

Philadelphia Gear Works, Inc., G St. and Erie Ave. Philadelphia, Pa.
Control valves

Philadelphia Scientific Glass Co., 4 Eckard Ave., Abington, Pa.
Scientific and industrial instruments

Philadelphia Thermometer Co., 6th and Cayuga Sts., Philadelphia 40, Pa.
Instruments for temperature indication, control & regulation

Philamon Labs., 90 Hopper St., Westbury, L. I., N. Y.
Tuning fork resonators and frequency standards
(See advertisement on page 47)

Philbrick Researches, Inc., George A., 230 Congress St., Boston 10, Mass.
Computers and analogs

Philco Corp., Accessories Div., Tioga and C Sts., Philadelphia, Pa.
Electrical and electronic instrumentation; components; batteries

Philips Manufacturing Co., 3475 W. Touhy Ave., Chicago 45, Ill.
Vapor degreasers & instrument cleaning machines

Phillips & Hiss Co., 1155 McCadden Place, Hollywood 38, Calif.
Precision drilling machines.
(See advertisement on page 178)

Phillips Control Corp., 59 W. Washington, Joliet, Ill.
Relays and solenoids

Phillips-Drucker, 2245 S. Vandeventer, St. Louis 10, Mo.
Centrifuges

Phillips Petroleum Co., Bartlesville, Okla.
Automatic analyzers, chemical composition recorders, laboratory apparatus

Phipps and Bird, Inc., 303 S. Sixth St., Richmond 5, Va.
Laboratory apparatus & chemicals

Phoenix Precision Instrument Co., 3803 N. 5th St., Philadelphia 40, Pa.
Laboratory equipment; photometers
(See advertisement on page 169)

Photo Research Corp., 127-129 W. Alameda Ave., Burbank, Calif.
Optical instruments and testers
(See advertisement on page 168)

Photocircuits Corporation, New Street, Glen Cove, N. Y.
Printed circuits and components

Photocon Research Products, 421 N. Foothill Blvd., Pasadena 8, Calif.
Precision mechanical instruments
(See advertisement on page 180)

Photogrametry Inc., 901 Pershing Drive, Silver Spring, Md.
Photographic and optical instruments and components

Photographic Products Inc., 1000 N. Olive St., Anaheim, Calif.
Recording and oscilloscope cameras

Photovolt Corp., 95 Madison Ave., New York 16, N. Y.
Photo-electric elements, photometers electronic timing devices, photo-electric colorimeters, photo-electric exposure meters, densitometers

Photron Instrument Co., 6516 Detroit Ave., Cleveland 2, Ohio
Photoelectric colorimeters
(See advertisement on page 164)

Physical Research Labs., Inc., 1909 Park Ave., New York 35, N. Y.
Humidity and moisture-content measurement and automatic control

Physics Research Labs., Inc., 507 Hempstead Turnpike, West Hempstead, N. Y.
Electrical and electronic instrumentation
(See advertisement on pages 147, 218)

Pickard & Burns, Inc., 240 Highland Ave., Needham, Mass.
Amplifiers

Picker X-Ray Corp., 25 South Broadway, White Plains, N. Y.
X-ray equipment

Pierce Watch Company, 22 West 48th St., New York 19, N. Y.
Stop watches

Pike & Co., E. W., 492 North Ave., Elizabeth 3, N. J.
Illuminated magnifiers & microscopes

Pipe Machinery Co., 930 E. 70th St., Cleveland, Ohio
Inspection gages

Pitometer Log Corp., 237 Lafayette St., New York 12, N. Y.
Pilot tube flowmeters

Pittsburgh Instrument & Machine Co., 1026 Reedsdale St., Pittsburgh 12, Pa.
Brinell Machines, alternating impact machines, surveying instruments

Pittsburgh Lectrodryer Corp., P. O. Box 1766, Pittsburgh, Pa.
Instrument air dryers

Planet Mfg. Co., 225 Belleville Ave., Bloomfield, N J.
Electrolytic capacitors

Plastic Capacitors, Inc., 2511 W. Moffat St., Chicago 47, Ill.
Electrical and electronic components

Plastic Service Guild, 233 Condor St., East Boston 28, Mass.
Chemically resistant plastic coatings for metal

Plummer & Kershaw, 2757 Frankford Ave., Philadelphia 34, Pa.
Optical parts

P-M Industries, 280 Fairfield Ave., Stamford, Conn.
Electromechanical components

Pneumatic Scale Corp., Ltd., Quincy, Mass.
Automatic filling machines; scales

Pneumercator Co., Inc., 305 E. 46 St., New York 17, N. Y.
Level indicators

Pneu-Trol Devices, Inc., 1436 N. Keating Ave., Chicago 51, Ill.
Automatic time-control systems; control valves

Podbielniak, Inc., 341 East Ohio St., Chicago 11, Ill.
Scientific and industrial laboratory apparatus

Polarad Electronics Co., 43-20 34th St., L. I. C., N. Y.
Amplifiers, audiofrequency equipment, oscillators, remote control equipment

Polarized Light-Photoelastic Co., 96 Tompkins Circle, Staten Island 1, N. Y.
Photoelastic polariscopes

Polarizing Instrument Co., Buckhout St., Mt. Kisco, N. Y.
Photoelasticity apparatus

Pollak Corp., Joseph, 81 Freeport St., Boston 22, Mass.
Relays; electromechanical components
(See advertisement on page 190)

Polyphase Instrument Co., 701 Haverford Rd., Bryn Mawr, Pa.
Stress-strain recorders; electrical testing and measuring instruments; transistor testers; analyzers; components

Polytechnic Research & Development Co., Inc., 202 Tillary St., Brooklyn, N. Y.
Electronic instruments, regulated power supplies

Poole Instruments Inc., 150 Express St., Dallas, Texas
Tube inside micrometer for big gun internal measurements and refinery still tubes

Porter, Inc., George K., Box 216, Hatboro, Pa.
Glass blowing, precision cylindrical and tapered tubing

Portman Instrument Co., Town Dock Road, New Rochelle, N. Y.
Optical comparators, projectors and gages; microscopes

Posen & Kline Tube Co., Whitehall Rd. & Township Line, P. O. Box 549, Norristown, Pa.
Capillary & bourdon tubing

Post Company, Frederick, P. O. Box 803, Chicago 90.
Instruments & equipment for architect & engineer

Post Machinery Co., Electronic Products Div., 140 Elliott St., Beverly, Mass.
High speed electronic counter

Potter Aeronautical Co., P. O. Box 532, Route No. 22, Union, N. J.
Aircraft power-plant instruments, industrial flowmeters & frequency meters
(See advertisement on page 51)

Potter Co., 1950 Sheridan Rd., North Chicago, Ill.
Capacitors

Potter & Brumfield Mfg. Co., Princeton, Ind.
Relays

Potter Instrument Co., 115 Cutter Mill Road, Great Neck, L.I., N. Y.
Photoelectric counters and controls

Power Designs, Inc., 119-22 Atlantic Ave., Richmond Hill 19, N. Y.
Automatic voltage and current regulators; amplifiers; power supplies
(See advertisement on page 176)

Power Equipment Co., 55 Antionette St., Detroit 2, Mich.
Power supplies; battery chargers and eliminators; push button switches

Powers Regulator Co., 3400 Oakton St., Skokie, Ill.
Temperature, humidity, and pressure controllers, indicators, and recorders; automatic control systems for heating and air conditioning
(See advertisements on pages 5, 106, 189, 231)

Praktica Co., Inc., The, 705 Bronx River Rd., Bronxville 8, N. Y.
Cameras and accessories

Pratt & Whitney, Div. Niles-Bement Pond Co., Hartford 1, Conn.
Machine shop instruments

Precise Development Corp., 2 Neil Court, Oceanside, L.I., N. Y.
Electrical and electronic instrumentation

Precise Measurements Co., 942 Kings Highway, Brooklyn 23, N. Y.
Optical and electrical instruments, fluorescent chemicals and tubes, ultraviolet light sources
(See advertisement on page 52)

Precision Apparatus Co., Inc., 70-31 84th St., Glendale 27, L.I., N. Y.
Radio test instruments

Precision Electronics, Inc., 9101 King St., Franklin Park, Ill.
Electrical and electronic instrumentation

Precision Gage & Tool Co., 320 East 3d St., Dayton 2, Ohio
Machine shop gages

Precision Products, Inc., 530 So. Quaker, Tulsa, Okla.
Time switches

Precision Radiation Instruments, Inc., 2235 S. LaBrea Ave., Los Angeles 16, Calif.
Alpha, beta and gamma counters

Precision Resistance Co., Central Park Ave., Box 116, Yonkers, N. Y.
Fixed and variable resistors; negative-temperature-coefficient resistors

Precision Resistor Co., 334 Badger Ave., Newark 8, N. J.
Resistors

Precision Scientific Co., 3737 W. Cortland St., Chicago 47, Ill.
Standard & custom-built laboratory equipment

Precision Thermometer & Instrument Co, 1434 Brandywine St., Philadelphia 30, Pa.

Precision Tube Company, Wissahickson Ave. & Church Rd., North Wales, Pa.
Fine tubing & metal shielded wire

Preferred Utilities Mfg. Corp., 1860 Broadway, New York, N. Y.
Boiler plant instruments

Preis Engraving Machine Co., H. P., 651 State Highway 22, Hillside, N. J.
Engraving, etching, marking and printing machines, tools and supplies
(See advertisement on page 115)

Preiser Co., Inc., B., P. O. Box 6118, Charleston 2, W. Va.
Laboratory equipment and supplies

Premier Metal Etching Co., 21-03 44th Ave., Long Island City, N. Y.
Scales, rules, dials, etc.; fluorescent and radioactive pointers, etc.
(See advertisement on page 135)

Premier Research Laboratories, Inc., 79 Seventh Ave., New York 11, N. Y.
Piezo electric quartz and tourmaline crystals, reactance & capacity meters

Presin Co., 5225 Wilshire Blvd., Los Angeles 36, Calif.
Program controllers; counters; totalizers; tachometers

Pressure Products Industries, Inc., Hatboro, Pa.
Pressure instrumentation, pumps, autoclaves, valves; components

Presto Recording Corp., Paramus, N. J.
Magnetic tape recorder

Price Electric Corp., Frederick, Md.
Relays

Pritchard Co. of Calif., J. F., 4625 Roanoke Pkwy., Kansas City 12, Mo.
Instrument air dryers

Probescope Co., 44-05 30th Ave., Long Island City 3, N. Y.
Electrical and electronic instrumentation

Process Controls Co., 2 East End Ave., New York 21, N. Y.
Designers and builders of electrical, mechanical and electronic controls for automatic equipment and processes

Process & Instruments, 15 Stone Ave., Brooklyn 33, N. Y.
Scientific instruments

Production Instrument Co., 710 W. Jackson Blvd., Chicago 6, Ill.
Electric & mechanical counting, timing & recording devices & actuating switches

Progressive Service Co., 2743 Locust St., St. Louis, Mo.
Dimensional gages
(See advertisement on page 132)

Proportioneers, Inc., 345 Harris Ave., Providence 1, R. I.
Automatic controlling & proportioning equipment

P-W Industries, Duncan & Melrose Sts., Philadelphia 43, Pa.
Cable and tubing supports
(See advertisement on page 139)

Pyle National Co., 1334 N. Kostner Ave. Chicago 51, Ill.
Connectors

Pyramid Instrument Corp., 630 Merrick Rd., Lynbrook, N. Y.
Electrical instruments, pyrometers

Pyrometer Instrument Co., Inc., Bergenfield 4, N. J.
Pyrometers
(See advertisement on page 185)

Pyrometer Service Co., 228 River Rd., Arlington, N. J.
Pyrometer tubes, thermocouples

Q

Quaid Fabricators Inc., 157 West Oxford St., Philadelphia, Pa.
Panels; autoclaves

Quality Electric Co., 2212 S. Hill St., Los Angeles 15, Calif.
Automotive testing sets

Quartz Products Corp., 688 Somerset St., Watching, N. J.

R

Racine & Co., Inc., Jules, 20 West 47th St., New York 19, N. Y.
Stop watches

Radex Corp., 2076 Elston Ave., Chicago 14, Ill.
Electrical testers

Radiaphone Co., 600 Evergreen Ave., Monrovia, Calif.
Electrical and electronic instrumentation

Radiation, Inc., P. O. Drawer Q, Melbourne, Fla.
Force-measuring equipment, aircraft test instruments

Radiation Counter Labs., 5122 W. Grove St., Skokie, Ill.
Geiger-Muller counters, radium detectors

Radiation Instrument Dev. Lab., 2337 W. 67th St., Chicago 36, Ill.
Radioactivity detecting and measuring instrumentation; laboratory apparatus; vacuum gages

Radio Apparatus Corp., 55 N. New Jersey St., Indianapolis 4, Ind.
Automatic voltage regulators

Radio City Products, Inc., Centre & Glendale Sts., Easton, Pa.
Electrical & radio testing instruments & accessories

Radio Corp. of America, See RCA Div.

Radio Engineering Co., Inquirer Bldg., Phila. 30, Pa.

Radio Frequency Laboratories Inc., Boonton, N. J.
Electronic equipment

Radio Receptor Co., Inc., 251 West 19th St., New York 11, N. Y.
Radio test instruments, remote control systems

Radioactive Products, Inc., 6540 W. Congress St. Detroit 26, Mich.
Radiation survey instruments, electrical and testing instruments

Rafton Engineering Corp., P. O. Box 8, Andover, Mass.
Laboratory mills

Rahm Instruments, Inc., 12 W. Broadway, New York 7, N. Y.
Potentiometer transducers for pressure, altitude, air speed and acceleration
(See advertisement on page 174)

Rainhart Co., P.O. Box 4065, Austin 51, Texas
Soil compactors; concrete and soil testing instrumentation

Rakit Corporation, 711 South 50th St., Philadelphia, Pa.
Instrument tubing troughs and supports

Ramapo Engineering Co., 1 Dey Lane, Riverdale, N. J.
Electrical-mechanical-hydraulic test stands; flow-rate meters; control boards; wave filters

Ranco, Inc., 601 West Fifth Ave., Columbus 1, Ohio
Refrigeration controls

Rapid Electric Co., 2881 Middletown Rd., New York 61, N. Y.
Power supplies; rectifiers; components

Rapidesign, Inc., 808 W. Doran St., Glendale, Calif.

Rascher & Betzold, Inc., 730 N. Franklin St., Chicago 10, Ill.
Laboratory supplies

Rattray & Co., Inc., George, 166-08 Myrtle Ave., Richmond Hill 18, N. Y.
Voltage-dividing resistors

Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill.
Cathode ray tubes

Rauland-Borg Corp., 3523 W. Addison St., Chicago 18, Ill.
Amplifiers, audio-frequency equipment, microphones

Rawson Electrical Instrument Co., 112 Potter St., Cambridge, Mass.
Dynamometers, electrical testing instruments; timers

Raycon Corp., 248 Harbor Blvd., Belmont, Calif.
Counters

Ray-O-Vac Co., See Specialty Battery Div.

Raytheon Mfg. Co., Equip. Mkt. Div., 100 River St., Waltham, Mass.
Automatic & manually controlled rectifiers for all communication, industrial or laboratory applications

Raytheon Mfg. Co., Equipment Sales Div., 100 River St., Waltham, Mass.
Radar systems and components; aircraft and marine navigation instruments; electronic components

Raytheon Mfg. Co., Receiving and Cathode Ray Tube Opns., 55 Chapel St., Newton, Mass.
Electron tubes; cathode-ray tubes

R-B-M Div., See Essex Wire Corp.

RCA Division, Radio Corporation of America, Camden, N. J., Tube Div., 415 S. Fifth St., Harrison, N. J.
Radio & electronic equipment for all purposes including laboratory & industrial apparatus

R.C.L. Mfg. Co., St. Mihiel Drive, Riverside, N. J.
Resistors and rheostats

R. C. Scientific Instrument Co., 307 Culver Blvd., Playa del Rey, Calif.
Radiation counters

Rea Co., Inc., J. B., 1723 Cloverfield Blvd., Santa Monica, Calif.
Industrial electrical and mechanical instrumentation

Red Bank Div., See Bendix Aviation Corp.

Redington Co., F. B., 112 S. Sangamon St., Chicago 7, Ill.
Counters: production, revolution, stroke

Redmond Co., Inc., Owasso, Mich.
Fractional horsepower motors

Red Point Products, Inc., 1907 Riverside Drive, Glendale 1, Calif.
Impregnating equipment and materials
(See advertisement on page 136)

Reed Research, Inc., 1048 Potomic Ave. N.W., Washington 7, D. C.
Computers, oscillographs, analyzers

Reeder & Co., Charles M., 171 Victor Ave., Detroit 3, Mich.

Reeves Hoffman Corp., 321 Cherry St., Carlisle, Pa.
Piezoelectric and quartz crystals

Reeves Instrument Corp., 215 E. 91 St., New York 28, N. Y.
Computers

Reeves Pulley Div., Reliance Electric Co., 1225 Seventh St., Columbus, Ind.
Speed control equipment

Refinery Supply Co., 621 East Fourth St., Tulsa 3, Okla.

Stress Corrosion of Mild Steel

By JAMES T. WABER, Ph.D.
Research Assistant Professor of Chemistry, Member of Staff, Corrosion Research Laboratory

and HUGH J. McDONALD, Sc.D.
Professor of Chemistry, Director, Corrosion Research Laboratory, Illinois Institute of Technology

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3820 So. 59th Court, Cicero 50, Illinois

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Gas testing instruments & specialties for oil & gas industry & laboratory supplies

Refrigeration Systems, Inc., 646 W. Washington St., Chicago 6, Ill.
Temperature and humidity cabinets, cloud-and-pour oil testers

Regent Controls, Inc., 37 North 2nd Ave., Mt. Vernon, N. Y.
Automatic control systems

Reiner Electronics Co., Centre & Glendale Sts., Easton, Pa.
Electronic testing equipment

Relay Sales, 4721 W. Madison St., Chicago 44, Ill.
Distributor of relays, timers, switches, etc.

Relay Service Co., 1310-12 N. Pulaski Rd., Chicago 51, Ill.
Relays

Reliable Instrument Co., Inc., 505 North Eighth St., Philadelphia 23, Pa.
Temperature, humidity, and dimensional instrumentation

Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio
Motors, generators, tachometers

Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland 3, Ohio
Steam specialties

Reliance Instr. Mfg. Corp., 76 Court St., Brooklyn 1, N. Y.
Automatic control systems for furnaces, boilers, reactors, etc; valve-operating devices

Remington Rand, 315 Fourth Ave., New York 10, N. Y.
Computers; microfilm cameras

Remington Rand Corp., See Eckert-Mauchly Div.

Renick Co., L. C., 3820 S. 59th Court, Cicero 50, Ill.
Panels, consoles, dials
(See advertisement on page 267)

Reon Resistor Corp., 117 Stanley Ave., Yonkers, N. Y.
Resistors; resistance testers

Republic Flow Meters Co., 2240 Diversey Parkway, Chicago 47, Ill.
Remote reading flow meters, complete line of power plant & industrial instruments for the measurement of flow, level pressure, draft, temperature & CO_2. Automatic boiler controls, regulators, valves and de-superheaters
(See advertisement on pages 100, 102, 120, 125, 179, 233)

Republic Gage Co., 2228 Fenkel Ave., Detroit 38, Mich.
Dimensional gages

Republic Mfg. Co., 15655 Brook Park Rd., Cleveland 11, Ohio
Relief valves; regulating valves; turn-and-bank indicators; pressure snubbers
(See advertisement on page 232)

Rese Engineering Co., 731 Arch St., Philadelphia 6, Pa.
Electrical and electronic instrumentation

Research Controls, Box 5035, Tulsa, Okla.
Automatic and manual controllers, valves, components

Research Equipment Corp., 1135 Third St., Oakland, Calif.
Chromatography and electrophoresis apparatus

Research Specialties Co., 1148 Walnut St., Berkeley 7, Calif.
Lab instrumentation

Resistance Products Co., 914 S. 13th St., Harrisburg, Pa.
Resistors

Resistors, Inc., 5226 West 26 St., Chicago 50, Ill
Resistors adjustable, variable & wire wound

Revco Inc., 2 East Franklin, Minneapolis 4, Minn.
Automatic speed controllers; variable-speed drives

Revere Corporation of America, P. O. Box 304, Walingford, Conn.
Thermocouples for liquids, air, metal, hot gases, thermocouple wire, hardnesses and leads. Pitot tubes (shielded and unshielded) Engine & Flight test recording accessories

Rex Rheostat Co., 3 Foxhurst Rd., Baldwin L.I., N. Y.
Protected and unprotected slide-contact rheostats & adjustable, wire wound resistors
(See advertisement on page 199)

Reynolds Gas Regulator Co., Anderson, Ind.
Automatic valves & regulators

Rhodes, Inc., M. H., 30 Bartholomew Ave., Hartford 6, Conn.
Time switches

Richards Co., Inc., Arklay S., 52 Winchester St., Newton Highland 61, Mass.
Thermocouples, lead wire & protection tubes
(See advertisement on page 219)

Richardson-Allen Corp., 15 W. 20th St., New York 11, N. Y.
Timers and time switches

Richardson Scale Co., Clifton, N. J.
Automatic weighing machinery

Richmont, Inc., 922 S. Myrtle Ave., Monrovia, Calif.
Torque instruments and tools

Riehle Testing Machine Division, American Machine & Metals Inc., East Moline, Ill.
Testing machines & testing instruments for tension, compression, bending, torsion, shear, hardness, wear

Rieker Instrument Co., 1919 Fairmount Ave., Philadelphia 30, Pa.
Scientific instruments

Rimat Tool Co., 21 W. Dayton St., Pasadena 2, Calif.
Micrometers

Ritchie & Son, E. S., 112 Cypress St., Brookline 46, Mass.
Marine instruments

Riverbank Laboratories, Geneva, Ill.
Tuning forks

Riverside Mfg. & Electrical Supply Co., 10221 Michigan Ave., Dearborn, Michigan
Switches

R.K.L. Valve & Mfg. Co., 1623 Elaine St., Philadelphia 19, Pa.

R & M Mfg. Co., Royal Oak, Mich.
Machine shop gages

Robbins & Associates, 1735 W. Florence Ave., Los Angeles 47, Calif.

Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield 99, Ohio

Robertshaw-Fulton Controls Co., See Bridgeport Thermostat Div., Fielden Instrument Div., & Fulton Sylphon Div.

Robertson & Co., John H., 4153 W. Belmont Ave., Chicago 41, Ill.
Scientific glassware, laboratory apparatus

Robertson & Ruth, Box 534, Elmhurst, Illinois
Instrument and electronic hardware; dial hole-cutting saw

Robinette Co., W. C., 802 Fair Oaks Ave., S. Pasadena, Calif.
Automatic control devices

Robinson Aviation, Inc., Teterboro Airport, Teterboro, N. J.
Antivibration mountings

Robinson Co., E. E. 95 Park Ave., Nutley 10, N. J.
Metering and proportioning pumps

Robinson Orifice Fitting Co., 2830 Lugo St., Los Angeles 23, Calif.
Orifice fittings & plates
(See advertisement on page 162)

Rochester Electronics Co., Inc., P. O. Box 227, Penfield, N. Y.
Decade resistors

Rochester Mfg. Co., Inc., 100 Rockwood St., Rochester 10, N. Y.
Pressure & liquid level indicators & thermometers

Rockwell Co., Stanley P., 296 Homestead Ave., Hartford 5, Conn.
Dilatometers

Rockwell Co., W. S., 200 Eliot St., Fairfield, Conn.
Butterfly control valves

Rockwell Engineering Co., 4063 N. New Jersey St., Indianapolis 5, Ind.
Special instruments

Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.
Fluid meters

Rockwell Register Corp., Macnicek Div. Rockwell Mfg. Co., 510 S. Lansing Ave., Tulsa 10, Okla.

Rockwood Sprinkler Co., 38 Harlow St., Worcester 5, Mass.
Air-operated valves; pipe detectors

Roemer Drug Co., 606 N. Broadway, Milwaukee 2, Wis.
Laboratory supply house

Roller-Smith Corp., 1825 W. Market St., Bethlehem, Pa.
Instruments (indicating & graphic) air & oil circuit breakers, relays, switchboards, precision balances, transformers, instrument & control switches

Rollin Co., 2010 Lincoln Ave., Pasadena 3, Calif.
Electronic test equipment

Ronar, Inc., 1316 Sherman Ave., Evanston, Ill.
Electronic stethoscope; polariscopes; electrical and electronic components

Roots-Connersville Blower Co., Connersville, Ind.
Positive-displacement fluid meters; pumps; blowers; gas generators

Rosen Engineering Products, Inc. Raymond, 32nd & Walnut Sts., Philadelphia 4, Pa.
Telemetering

Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich.
Automatic control systems

Rotron Controls Corp., 7-9 Schoonmaker Lane, Woodstock, N. Y.
Fractional hp. motors

Royson Engr. Co., Jacksonville & Montgomery Rds., Hatboro, Pa.

R-P&C Valve Division. See American Chain & Cable Co., Inc.

R. S. Electronics Corp., P. O. Box 368, Sta. A, Palo Alto, Calif.
Power supplies, electrical and electronic components

R-S Products Corp., 4523 Germantown Ave., Philadelphia 44, Pa.
Butterfly valves

Rubicon Co., Ridge Ave. at 35th St., Philadelphia 32, Pa.
Precision electrical instruments: potentiometers, galvanometers, bridges resistance standards, Photoelectric colorimeters, transmission dynamometers

Rudolph & Sons, O. C., P. O. Box 446, Caldwell, N. J.
Optical instruments

Ruehfel Co., George, 107-20 101 Ave., Richmond Hill, L. I., N. Y.
Laboratory instruments & apparatus

Ruge-de Forest, Inc., 84 Massachusetts Ave., Cambridge 39, Mass.
Strain gages and strain-gage instrumentation; temperature, pressure and force measuring instruments

Rupp & Bowman Co., 315 Superior St., Toledo 3, Ohio
Laboratory supplies

Ruska Instrument Corp., 4607 Montrose Blvd., Houston 6, Texas
Geophysical instruments

Rust Industrial Company, 130 Silver St., Manchester, N. H.

Rutherford Electronics Co., 3707 S. Robertson Blvd., Culver City, Calif.
Calibrating equipment for electrical and electronic instruments, radar simulators

Rutico, Inc., Box 1151M, Pasadena 1, Calif.
Industrial and surveying instruments

Ryan Recording Thermometer Co., 851 Poplar Pl., Seattle 44, Wash.
Portable recording thermometers for perishables in transit or storage

Ryan Tool & Engineering Co., 19159 John R. St., Detroit 3, Mich.
Height gages, fixtures, special machinery

S

Saart, Kraemer & Hanscom, Inc., Box 636, Saundertown, R. I.
Machine shop gages

Sampson Chemical & Pigment Corp., 2830 W. Lake St., Chicago 12, Ill.
Phosphorescent and fluorescent coatings
(See advertisement on page 113)

San Fernando Electric Mfg. Co., 1509 First St., S. E. San Fernando, Calif.
Electrical and electronic components

Sanborn Co., 39 Osborne St., Cambridge, Mass.
Electronic instruments

Sangamo Electric Company, 1022 Converge Ave., Springfield, Ill. Capacitor Div., Marion, Ill.
Electric meters, instrument transformers, time switches & radio condensers

Sangamo Generators, Inc., 2110 Clear Lake Ave., Springfield, Ill.
Motors, generators, inverters

Sarco Company, Inc., 350 Fifth Ave., New York 1, N. Y.
Temperature regulators

Sargent & Co., 4647 Foster Ave., Chicago 30, Ill.
Laboratory supplies & chemicals

Saxl Instrument Co., Harvard, Mass.
Tension and torque measuring instruments

Saxonburg Ceramics, P. O. Box 157, Saxonburg, Pa.
Insulation testers; insulating materials

SCAM Instrument Corp., 3909 W. Irving Park Rd., Chicago 18, Ill.
Annunciator and alarm systems

Schaar & Co., 754 W. Lexington St., Chicago 7, Ill.
Laboratory supplies

Schade Valve Mfg. Co., 2527 N. Bodine St., Philadelphia 33, Pa.
Automatic valves

Schaefer Bros., Co., 1059 W. 11th St., Chicago 7, Ill.
Rheostats

Schaevitz Engr., Crescent Blvd. at Drexel Ave., Camden, N. J.
Accelerometers, extensometers, position indicators, remote metering equipment
(See advertisements on pages 74, 214, 215, 226)

Schaffer Poidometer Co., 2828 Smallman St., Pittsburgh 22, Pa.
Scales

Schauer Mfg. Corp., 4500 Alpine Rd., Rossmoyne, Cincinnati 36, Ohio
Battery chargers, battery eliminators and rectifiers

Scherr Co., Inc., George, 200 Lafayette St., New York 12, N. Y.
Optical measuring and inspection equipment
(See advertisement on page 148)

Scherr Optical Tools, Inc., 200 Lafayette St., N. Y. 12, N. Y.
Shop instruments and components
(See advertisement on page 149)

Schneider-Cogswell, Inc., 1849 Halstead St., Chicago 14, Ill.
Precision lenses and prisms

Schrader's Son, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.
Pneumatic cylinders; safety valves; regulating valves; solenoid valves

Schutte & Koerting Co., Cornwells Heights, Bucks County, Pa.
Rotameters

Schutte Optical Co., Inc., 16 Dowling Place, Rochester 5, N. Y.
Optical instruments and components

Schuttig & Co., 5005 Calvert Rd., College Park, Md.
Radio and wired remote-control equipment

Schweitzer Mfg. Co., Inc., E. O., 1002 Dundee Rd., Northbrook, Ill.
Electrical instruments

Schwien Engineering Co., 16217 Lindbergh St., Van Nuys, Calif.
Aircraft instruments & pressure control instruments

Scientific Apparatus Co., 4 Landscape Ave., Yonkers 5, N. Y.
Laboratory apparatus

Scientific Development Co., Box 795, State College, Pa.
Automatic control systems; distillation columns

Scientific Equipment Co., 3527 Lancaster Ave., Philadelphia 4, Pa.
Laboratory apparatus

Scientific Glass Apparatus Co., Inc., 100 Lakewood Terrace, Bloomfield, N. J.
Glass apparatus & interchangeable ground glass joints

Scientific Instrument Co., 1041 Second St., Detroit 26, Mich.
Industrial & laboratory thermometers; hydrometers; special laboratory apparatus

Scientific Instrument Development Labs., 4070 N. Kenmore Ave., Suite 310, Chicago 13, Ill.
Industrial and scientific instruments

Scientific Specialties Corp., Snow & Union Sts., Brighton Sta., Boston 35, Mass.
Medical research instruments; pressure and vacuum gages; VT voltmeters; optical instruments

Scope Instrument Corp., Scope Building, Mamaroneck, N. Y.

Scott, Inc., Hermon Hosmer, 385 Putnam Ave., Cambridge 39, Mass.
Electronic instruments

Scott Testers, Inc., 101 Blackstone St., Providence, R. I.
Testing machines

Scovill Mfg. Co., P. O. Box 1820, Waterbury 20, Conn.
Tube fittings

Security Valve Corp., 541 W. Garfield Ave., Glendale 4, Calif.
Automatic and manually operated valves

Seedburo Equipment Co., 618 W. Jackson Blvd., Chicago 6, Ill.
Moisture-testers, ovens, scales, thermometers

Seederer-Kohlbusch, Inc., 27-29 S. Van Brunt St., Englewood, N. J.
Analytical balances & weights

Seely Instrument Co., 377 Fourth St., Niagara Falls, N. Y.
Industrial process controllers; components

Seely Instrument Co., Inc., 377 4th St., Niagara Falls, N. Y.
Controllers & valves

Seismograph Service Corp., P. O. Box 1590-D, Tulsa 1, Okla.
Geophysical instruments

Sela Electronics Co., 128 W. 48th St., New York 36, N. Y.
Static eliminators; electronic components

Selas Corp. of America, Erie Ave. & "D" St., Philadelphia 34, Pa.
Pressure, flow and combustion controllers; instrument-air dehydrators; rotameters; laboratory micro-filters

Sell Electric Co., H. H., 3240 Dakota Ave., Minneapolis 16, Minn.
Phase sequence indicators

Sendur Mfg. Co., 3225 N. Sheffield St., Chicago 13, Ill.
Electrical instruments

Sensitive Research Instrument Co., 9-11 Elm Ave., Mt. Vernon, N. Y.
Electrical instruments measuring quantities or values of small current or voltage

Sequoia Process Corp., 871 Willow St., P. O. Box 1007, Redwood City, Calif.
Electrical and electronic components

Seraphin Test Measure Co., 1314 North 7th St., Philadelphia 22, Pa.
Volumetric standards

Serdex, Inc., 91 Cambridge St., Boston 14, Mass.
Meteorological instruments
(See advertisement on page 135)

Service Recorder Co., 1375 Euclid Ave., Cleveland 15, Ohio
Vehicle recorders

Servo Corp. of America, 2020 Jericho Pike, New Hyde Park, N. Y.
Servomechanisms, computers, automatic control equipment and aircraft instruments

Servomechanisms Inc., 500 Franklin Avenue, Garden City, L.I., N. Y.
Computers, amplifiers, servomotors

Servonic Instruments, Inc., 1145 S. Fair Oaks Ave., Pasadena, Calif.
Industrial and aircraft instruments
(See advertisement on page 181)

Servospeed Div., Electro Devices Inc., 4 Godwin Ave., Paterson 1, N. J.
Machine tool control systems; variable speed drives
(See advertisement on page 112)

Servo-Tek Products Co., Inc., 1086 Goffle Rd., Hawthorne, N. J.
Motion, position and speed recorders

Servotrol Co., Framingham Centre, Mass.
Voltage-dividing resistors

Sessions Clock Co., Box C, Forestville, Conn.
Timepieces and automatic timers

Seth Thomas Clock Co., See Thomas, Seth

Shallcross Controls, Inc., 2217 N. 31 St., Milwaukee 8, Wis.
Furnace controls

Shallcross Manufacturing Co., 10 Jackson Ave., Collingdale, Penna.
Switches; resistors; electrical instruments

Shand & Jurs Co., 917 Carlton St., Berkeley 10, Calif.
Liquid level gages

Shasta Div., Beckman Insts., Inc., P. O. Box 296 Sta. A., Richmond, Calif.
Electrical and electronic instrumentation

Shawmut Engg. Co., 195 Freeport St., Boston 22, Mass.
Abrasion testers

Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Machine shop gages

Shelby Instrument Co., 321 West 7 St., Long Beach 2, Calif.
Electrical instruments

Sheldon & Co., E. H., Muskegon 82, Mich
Laboratory furniture

Sheldon Machine Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill.
Instrument lathes & milling machines

Shepard Labs., 480 Morris Ave., Summit, N. J.
Automatic exposure controllers, relays, ordnance instruments

Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn 6, N. Y.
Electrical testing equipment

Shielding, Inc., Riverside Park, N. J.
Radio noise filters

Shore Instrument & Mfg. Co., 90-35 Van Wyck Expressway, Jamaica 2, N. Y.
Scleroscope hardness testers
(See advertisement on page 214)

Shure Brothers, Inc., 225 W. Huron St., Chicago 10, Ill.
Microphones

Shurite Meters, 61 Hamilton St., New Haven 8, Conn.
Electrical panel & portable instruments
(See advertisement on page 77)

Sickles Co., F. W., Chicopee, Mass.
Electrical products

Sierra Electronic Corp., 1050 Brittan Ave., San Carlos, Calif.
Electrical and electronic instruments; transformers

Sightmaster Corp., 111 Cedar St., New Rochelle, N. Y
Microwave calorimeters; relays; welding rods

Sigma Instruments Inc., 170 Pearl St., South Braintree, Mass.
Relays

Signal Electric Mfg. Co., Menominee, Mich.
Fractional horsepower motors

Signal Engg. & Mfg. Co., 273 Branchport Ave., Long Branch, N. J.
Signalling systems; relays

Signal Indicator Co., 894 Broadway, New York 3, N. Y.
Dial lights

Simmonds Aerocessories, Inc., 105 White Plains Rd., Tarrytown, N. Y.
Remote-indicating equipment; fuel gages

Simplex Time Recorder Co., Sanborn St., P. O. Box 280, Gardner, Mass.
Time recording clocks

Simplex Valve & Meter Co., 7 E. Orange St., Lancaster, Pa.
Flow controls, meters, gages, proportioning & ratio control equipment

Simpson Electric Div., Am. Gage & Machine, 5200 W. Kinzie St., Chicago 44, Ill.
Electrical instruments

Simpson Optical Mfg. Co., 8200 W. Carroll Ave., Chicago 24, Ill.
Lenses, prisms, optical flats & complete optical systems
(See advertisement on page 161)

Sinclair Collins Valve Co., 454 Morgan Ave., Akron 11, Ohio
Automatic controllers and control valves

Sipp-Eastwood Corp., 39 Keen St., Paterson, N. J.
Electrical and electronic instruments; transformers

Sittler Corp., 18 North Ada St., Chicago 7, Ill.
Electrical testing sets; neon and solenoid type voltage testers

Size Control Company, Div. of American Gage & Machine Co., 2500 Washington Blvd., Chicago 12, Ill.
Machine shop & special gages, measuring wires

Sjostrom Co., John E., 1711 N. Tenth St., Philadelphia 22, Pa.
Laboratory furniture

Skaneateles Manufacturing Co., Inc., 122 Dickerson St., Syracuse 2, N. Y.
Vacuum gages

Skyway Precision Tool Co., 3217 Casitas Ave., Los Angeles 26, Calif.
Torque testers

Slater Electric & Mfg. Co., Inc., 37th Ave. & 56th St., Woodside 77, N. Y.
Valves; pressure snubbers; switches, wiring devices

Slocomb Co., J. T., 122 Naubuc Ave., Glastonbury, Conn.
Micrometer calipers

Small Motors, Inc., 2076 Elston Ave., Chicago 14, Ill.
Universal fractional horsepower motors, dynamotors, shaded pole motors & generators

Smith Co., S. Morgan, York, Pa.
Electromechanical components

Smith Control & Instrument Corp., 1329 Highland Ave., Needham 92, Mass.
Thermostats

Smith Corp., A. O. 5743 Smithway, Los Angeles 22, Calif.
Gasoline and oil meters

Smith Inc., Herman H., 2326 Nostrand Ave., Brooklyn 10, N. Y.
Electromechanical components

Smith Precision Products Co., 1135 Mission St., S. Pasadena, Calif.
Metering proportioning pumps

Sodemann Heat & Power Co., 1737 Macklind Ave., St. Louis 10, Mo.
Air conditioned moist cabinet

Soiltest, Inc., 4522 W. North Ave., Chicago 39, Ill.
Granular analyzing & test equipment

Sola Electric Co., 4633 W. 16th St., Chicago 50, Ill.
Transformers, automatic voltage adjusters
(See advertisement on page 226)

Sonoflux Corp., Commerce Bldg., Houston, Texas
Non-destructive inspection and testing equipment

Soreng Products Corp., 9555 Soreng Ave., Schiller Park, Ill.
Solenoids and switches, combustion control equipment

Sorensen & Co., Inc., 375 Fairchild Ave., Stamford, Conn.
Chokes, current regulators, voltage regulators, transformers

Sorvall, Ivan, P. O. Box 230, Pearl St., Norwalk, Conn.
Variable transformers

Sound Apparatus Co., Sterling, N. J.
Sound measuring equipment

South Bend Lathe Works, 303 E. Madison St., South Bend 22, Ind.
Precision lathes

Southern Desk Co., Hickory, N. C.
Laboratory furniture

Southern Electronics Co., 239 W. Orange Grove Ave., Burbank, Calif.
Precision capacitors including plastic film types
(See advertisement on page 90)

Southwest Control Co., P. O. Box 1702, Odessa, Texas
Liquid level alarms, controllers, indicators; oil well testing instruments

Southwestern Industrial Electronic Co., 2831 Post Oak Road, Houston 19, Texas
Geophysical instruments, industrial controls, electronic development

Sparling Meter Co., 945 N. Main St., Los Angeles 54, Calif.
Liquid meters

Spartan Coach & Mfg. Co., 319 N. Albany Ave., Chicago 12, Ill.
Edge-lighted panels

Special Instruments Lab. Inc., 312 W. Vine Ave., Knoxville, Tenn.
Radioactivity and geophysical instruments

Special Screw Products Co., 5445 Dunham Rd., Bedford, Ohio
Valves & tube fittings

Specialized Instruments Corp., 601 O'Neil Ave., Belmont, Calif.
Ultra-speed centrifuges

Specialties Inc., Skunks Misery Rd., Syosset, L. I., N. Y.
Computers, airborne instruments and cameras, air dehydrators

Specialty Battery Co., Div. of Ray-O-Vac, 212 East Washington Ave., Madison 3, Wis.
Dry batteries

Specialty Engineering and Mfg. Co., 108 E. Dedham St., Boston, Mass.
Specialists in precision engineering and light manufacturing

Spectrol Corp., 1704 S. Del Mar St., San Gabriel, Calif.
Electrical and electronic components

Speedometer Electric Co., 690 Van Ness Ave., San Francisco 2, Calif.
Survey footmeter

Speidel & Co., Inc., Chas. W., 614 Baltimore Ave., Fernwood, Pa.
Surveying instruments

Spellman Television Corp., 3029 Webster Ave., Bronx 67, N. Y.
High-voltage specialties; power supplies

Spence Engineering Co., Inc., 53 Grant St., Walden, N. Y.
Regulating valves

Spencer-Kennedy Labs., Inc., 186 Massachusetts Ave., Cambridge, Mass.

Spencer Mfg. Co., 3253 N. Cicero Ave., Chicago 41, Ill.
Automatic control systems; counters

Sperry Gyroscope Co., Inc., Great Neck, N. Y.
Aircraft & marine navigational instruments

Sperry Products, Inc., Shelter Rock Road, Danbury, Conn.
Special railway testers

Sperry-Sun Well Surveying Co., 3118 Blodgett Ave., P. O. Box 8008, Houston 4, Texas
Underground surveying instruments for oil wells

Spinco Div., Beckman Instruments, Inc., 601 O'Neil Ave., Belmont, Calif.
Lab instruments and components

Sprague Electric Co., Marshall St., North Adams, Mass.
Electrical instruments, resistors, capacitors and circuit components

Sprague Engineering Corp., Budlong Ave. at 135 St., P. O. Box 121, Gardena, Calif.
High-pressure pumps
(See advertisement on page 230)

Sprague Meter Co., 35 South Ave., Bridgeport 4, Conn.
Liquid meters

Sprengnether Instrument Co., Inc., 4567 Swan Ave., St. Louis 10, Mo.
Scientific instruments, magnetometers, seismographs
(See advertisement on page 200)

Squires Co., C. E., E. 18502 Syracuse Ave., Cleveland 10, Ohio
Feed water regulators & pump governors

Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.
Switches; relays; pressure and vacuum controllers; control valves; motor starters

Square D Co., See also Kollsman Inst. Div

Stackpole Carbon Co., Carbon Div., St. Marys, Pa.
Electrical and electronic components

Stafford Co., N., 145—58th St., Brooklyn 20, N. Y.
Nautical, naval & navigation instruments

Standard Arcturus Corp., 54 Clark St., Newark, N. J.
Vacuum tubes

Standard Cabinet Co., 56 Washington St., Carlstadt, N. J.
Test chambers: altitude, temperature, humidity
(See advertisement on page 93)

Standard Controls, Inc., 1230 Popular St., Seattle 44, Wash.
Hydraulically and electrically operated valves

Standard Dayton Corp., P. O. Box 1001, Dayton 1, Ohio
Fractional horsepower motors

Standard Electrical Products Co., 2240 E. 3rd St., Dayton 3, Ohio
Relays

Standard Electric Time Co., 89 Logan St., Springfield 2, Mass.
Electric stop clocks, electric time systems, watt hour meter testing equipment, program clocks, laboratory jack panels & small laboratory table service panels
(See advertisement on page 223)

Standard Electronic Research Corp., 2 East End Ave., New York 21, N. Y.

Standard Engineering & Machine Co., Inc., 3709 Capitol Trail, Marshalltown, Wilmington 8, Dela.
Automatic-control system; valves

Standard Gage Co., Inc., 70 Parker Ave., Poughkeepsie, N. Y.
Gages for linear measurements

Standard Instrument Corp., 350 Fifth Ave., New York, N. Y.
Automatic combustion controllers; gas analyzers; dust analyzers

Standard Piezo Co., P. O. Box 513, Carlisle, Pa.
Piezoelectric and quartz crystals

Standard Products, Inc., 650 E. Gilbert St., Wichita 11, Kan.
Aircraft and ground-station instruments, testing apparatus, precision tools

Standard Science Supply Co., 1231-39 N. Honore St., Chicago 22, Ill.
Laboratory supplies

Standard Scientific Supply Corp., 34 W. 4 St., New York 12, N. Y.
Laboratory supplies

Standard Thermometer, Inc., 952 Dorchester Ave., Boston 25, Mass.
Mechanical thermometers

Standard Tool & Machine Co., Woodland Rd., Pittsburgh 38, Pa.
Thermocouple assemblies

Standard Transformer Corp., 3580 Elston Ave., Chicago 18, Ill.
Transformers

Staplex Co., The, Air Sampler Div., 794 Fifth Ave., Brooklyn 32, N. Y.
High-volume air sampler for air pollution study and control.
(See advertisement on page 75)

Star Compass Co., 110 Antwerp St., East Milton, Mass.
Compasses

Starrett Co., L. S., Athol, Mass.
Precision tools, dial indicators & steel tapes

States Co., 19 New Park Ave., Hartford 6, Conn.
Electricity meter testers
(See advertisement on page 168)

Statham Development Corp., 12411 W. Olympic Blvd., Los Angeles 64, Calif.
Acclerometers, dynamometers, strain gages, flow-meters, pressure indicators, tension indicators

Stebar Co., 11 W. Lake St., Minneapolis 8, Minn.
Microscopes

Steel City Testing Machines, Inc., 8817 Lyndon Ave., Detroit 38, Mich.
Testing machines

Steiner-Ives Co., Springfield Rd., Union, N. J.

Sterling Engineering Co., Inc., 54 Mill St., Laconia 9, N. H.
Industrial measurement and control equipment

Sterling Inc., 3738 North Holton, Milwaukee 12, Wisc.
Motor operated valves

Sterling Mfg. Co., 7201 Wentworth St., Cleveland, Ohio
Battery testers and portable electrical instruments

Sterling Precision Instrument Corp., 34-17 Lawrence St., Flushing 54, N. Y.
Electrical and electronic instrumentation

Sterling Transformer Corp., 297 N. 7th St., Brooklyn 11, N. Y.
Transformers; adjustable transformers

Stevens-Arnold Co., 22 Elkins St., So. Boston 27, Mass.
Frequency & polarized relays
(See advertisement on page 96)

Stevens Mfg. Co., Inc., P. O. Annex 1007, Mansfield, Ohio
Controllers, automatic thermostatic; thermostats

Stewart, M. C., Ashburnham, Mass.
Meteorological instruments

Stewart Instrument Co., 6507 Grand River Ave., Detroit 8, Mich.
Production analyzers

Stewart Corp., F. W., 4311 Ravenswood Ave., Chicago 13, Ill.
Remote control equipment
(See advertisement on page 203)

Stewart-Warner Corp., 1826 Diversey Parkway, Chicago 14, Ill.
Tachometers and pressure gages

Sticht Co., Inc., Herman H. 27 Park Pl., New York 7, N. Y.
Electrical instruments
(See advertisements on pages 121, 207, 211)

Stocker & Yale, P. O. Box 8, Marblehead, Mass.
Optical instruments

Stoddart Aircraft Radio Co., Inc., 6644 Santa Monica Blvd., Hollywood 38, Cal.
R-f. instruments; sound and noise analyzers; attenuators
(See advertisement on page 49)

Stoelting, C. H. 424 N. Homan Ave., Chicago 24, Ill.
Laboratory supplies

Stokes Machine Company, F. J., 5500 Tabor Road, Philadelphia, Pa.
Special process machinery; pressure & vacuum gages; pellet presses; high vacuum pumps; McLeod vacuum gages; automatic water stills

John L. Stortz, 405 State St., Watertown, N. Y.
Industrial and laboratory mercurial thermometers

Strahman Valves, Inc., 16 Hudson St., New York 13, N. Y.
Liquid-level gages; automatic valves

Stratos, Div., Fairchild Engine & Airplane Corp., Bay Shore, L. I., New York

Streeter-Amet Company, 4101 Ravenswood, Chicago 13, Ill.
Automatic measuring, weighing & counting machines

Stromberg Time Corp., 135 S. Main St., Thomaston, Conn.
Timing devices & time clocks

Struthers-Dunn, Inc., 150 N. 13 St., Philadelphia 7, Pa.
Relays, timing devices, electric counters, thermostats

Studebaker Hydraulic Products Co., 1221 South 9th Ave., Maywood, Ill.
Laboratory presses

Sturdy Tool & Gage Co., 14520 Schaefer Highway, Detroit 27, Mich.
Precision tools and dimensional gages; torque gages; pressure and vacuum gages

Stupakoff Ceramic & Mfg. Div., Latrobe, Pa.
Ceramic thermocouple insulators and protection tubes
(See advertisement on page 6)

Sturtevant Co., P. A., Addison, Ill.
Torque measuring equipment
(See advertisement on page 210)

Summers Gyroscope Co., 2328 Broadway, Santa Monica, Calif.
Automatic pilots, and gyro servos

Sun Electric Corp., Harlem and Avondale, Chicago 31, Ill.
Electrical instruments & engines test equipment

Sun Radio & Electronics Company, 650—6th Ave., New York 11, N. Y.
Radio parts and test equipment distributor

Sunstrand Machine Tool Co., Sunstrand Hydraulic Div., 2210 Harrison Ave., Rockford, Ill.
Balancing machines, pumps, valves

Sunshine Scientific Instrument, 1810 Grant Ave., Philadelphia 15, Pa.
Electrical and electronic instrumentation

Superdraulic Corp., U. S. Truck Rt. 27, Somerset, Kentucky
Control systems and components; high-pressure testers.

Superex Electronics Corp., 4 Radford Place, Yonkers, N. Y.
Electronic components; plug-in circuits and components

Superior Air Products Co., 132 Malvern St., Newark 5, N. J.
Burettes

Superior Electric Co., 83 Laurel St., Bristol, Conn.
Industrial & laboratory apparatus

Superior Meter Co., Inc., 167 41st Street, Brooklyn, 32, N. Y.
Gas meters & appliances

Superior Tube Co., P. O. Box 191, Norristown, Pa.
Fine tubing

Supreme Inc., Greenwood, Miss.
Radio testing equipment; tube testers, set testers, analyzers, test oscillators, oscilloscopes & dynamic instruments

Surface Checking Gage Co., 5880 Hollywood Blvd., Hollywood 28, Calif.
Surface roughness standards and comparators

Surface Combustion Corp., 2375 Dorr Ave., Toledo 1, O.
Dew Point Recorder

Surface Finishes, Inc., 12 Official Rd., Addison, Ill.
Optical flats

Surty Mfg. Co., Inc., 4139 W. Kinzie St., Chicago 24, Ill.
Magnifiers

Suter, Alfred, 200 Fifth Ave., New York 10, N. Y.
Testing apparatus for textiles and metals

Suverkrop Instruments, Box 436, Bakersfield, Calif.
Drafting & Surveying instruments

Swartwout Co., 18511 Euclid Ave., Cleveland 12, Ohio
Furnace controllers

Swedish Gage Co. of America, 10641 Haggerty Ave., Dearborn 1, Mich.
Internal indicators; plug, ring, master disc & special built fixtures

Swieco, Inc., 1512 E. Lancaster, Fort Worth 3, Texas
Temperature indicators and controllers

Swissomatic Products, 1818 Stanford St., Santa Monica, Calif.
Precision instrument parts

Sylvania Electric Products, Inc., 1740 Broadway, New York 19, N. Y.
Electronic instruments

Synchro-Start Products Inc., 8151 Ridgeway St., Skokie, Ill.
Automatic starting-stopping safety controls for internal combustion engines

System Analyzer Corp., 700 W. State St., Nokomis, Ill.
Analog computers

T

TAB (Technical Apparatus Builders), 111 Liberty St., New York 6, N. Y.
Power supplies; electrical and electronic components
(See advertisement on page 178)

Taber Instrument Corp., 111 Goundry St., North Tonawanda, N. Y.
Testers for measuring wear & abrasion resistance of paints, electroplate, linoleum, leather, textiles; stiffness of paper, light metallic sheet & wire

Taft-Peirce Mfg. Co., 32 Mechanic Ave., Woonsocket, R. I.
Inspection and gaging equipment

Talboys Instrument Corp., 13 Ackerman Ave., Emerson, N. J.
Stirrers and accessories

Taller & Cooper, Inc., 75 Front St., Brooklyn 1, N. Y.
Wind tunnel instruments, panel boards
(See advertisement on page 195)

Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.
Pyrometers

Taper Micrometer Corp., 100 Grove St., Worcester, Mass.
Dimensional gaging equipment

Tartak Electronics Inc., 2979 No. Ontario St., Burbank, Calif.
Solenoids; transformers; chokers

Taylor & Co., W. A., 7300 York Rd., Baltimore 4, Maryland
Equipment for pH & chlorine control, control of phosphates in boiler water & for water analysis

Taylor Dynamometer & Machine Co., 6411 River Parkway, Milwaukee 13, Wis.
Dynamometers; balancing machines
(See advertisement on page 82)

Taylor Forge & Pipe Works, Inc., P. O. Box 485, Chicago 90, Ill.
Orifice flanges

Taylor Instrument Cos., 95 Ames St., Rochester 1, N. Y.
Indicating, recording & controlling instruments for temperature, humidity, pressure, rate of flow, & liquid level

Technical Appliance Corp., Sherburne, N. Y.
Antennas and allied equipment

Technical Associates, 140 W. Providencia Ave., Burbank, Calif.
Geiger-Mueller counter equipment; custom built instruments
(See advertisement on page 158)

Technical Charts, Inc., 189 Van Rennselaer St., Buffalo 10, N. Y.
Recorder charts, and ink
(See advertisement on page 95)

Technical Development Corp., 4060 Ince Blvd., Culver City, Calif.
Motors; electrical and electronic components
(See advertisement on page 155)

Technical Equipment Co., 745 Dwight Way, Berkeley Calif.
Fractionating columns, thermoregulators, viscosimeters and other laboratory instruments and accessories

Technical Instruments, Inc., 3732 Westheimer Rd., Houston 6, Texas
Geophysical instruments; galvanometers; cable testers; vibration pickups

Technical Measurement Corp., 140 State St., New Haven, Conn.
Electrical and electronic instrumentation

Technical Products Co., 19 North Dunlap, Memphis 1, Tenn.
Laboratory supply house

Techniflex Corp., 55 Jersey Ave., Port Jervis, N. Y.
Level indicators and controllers; motor-operated valves, positioners, etc.

Technique Associates, Inc., 211 E. South St., Indianapolis 25, Ind.
Pyrometers and pyrometric testing equipment
(See advertisement on page 184)

Technitrol Engineering Co., 2751 N. 4th St., Philadelphia 33, Pa.
Computers and their components

Technograph Printed Electronics, Inc., 185 Valley St., Tarrytown, N. Y.
Printed circuits; strain gages

Techno Instrument Co., 6666 Lexington Ave., Los Angeles 38, Calif.
Electrical and electronic instruments

Technology Instrument Corp., 531 Main St., Acton, Mass.
Special audio equipment
(See advertisement on page 50)

Tochron Co., The, 254-256 Friend St., Boston 14, Mass.
Printed circuits

Tejax Engineering Corp., 180 Weeden St., P. O. Box 348, Pawtucket, R. I.
Dial indicating handwheels, valve position indicators & V-port hand regulating valves

Tektronix, Inc., P. O. Box 831, Portland 7, Ore.
Cathode ray oscilloscopes & video test equipment

Telechrome, Inc., 88 Merrick Rd., Amityville, N. Y.
Photoelectric color comparators; Z-angle meters; r-f. instruments; oscilloscopes; counters; amplifiers; TV cameras; components

Telechron Dept. See General Electric Co., Telechron Dept.

Telecomputing Corp., 12838 Saticoy Ave., No. Hollywood, Calif.
Automatic plotters, computers, counters, projectors

Teleflex, Inc., P. O. Box 69, North Wales, Pa.
Control shafts, linkages and cables

Teletronics Laboratory Inc., 54 Kinkel St., Westbury, L. I., N. Y.
Custom design and manufacture of electronic and electro-mechanical devices

WANTED

Surveying instrument repair specialist for permanent position. Air conditioned shop. Completely equipped. Top hourly wage plus bonus. Contact Triangle Blue Print & Supply Company, 314 South Cincinnati, Tulsa, Oklahoma.

Televiso Corporation, 1415 Golf Road, Des Plaines, Ill.
Radio and electronic parts

Televiso Products Inc., 7466 Irving Park Rd., Chicago 34, Ill.
Electronic products; custom built equipment

Telewave Laboratories Inc., See Polarad Electronics Co.

Telex, Inc., E-A Div., Telex Park, St. Paul, Minn.
Decade boxes; slip rings

Telonic Industries, 444 S. Rural St., Indianapolis 1, Ind.
Signal generators and oscillators; amplifiers

Tempil Corp., 132 W. 22 St., New York, N. Y.
Thermascopic paint & thermometer sticks

Ten Bosch Inc., M., 80 Wheeler Ave., Pleasantville, N. Y.

C. Tennant Sons & Co., 100 Park Ave., New York 17, N. Y.

Tenney Engineering Co., 1090 Springfield Rd., Union, N. J.
Controlled temperature, humidity and altitude test chambers and rooms
(See advertisement on page 12)

Tensitron, Inc., Harvard, Mass.
Textile-industry instrumentation
(See advertisement on page 209)

Teplitz, Henry H., 185 N. Wabash Ave., Chicago 1, Ill.
Audiofrequency equipment; laboratory standard microphones

Testa Mfg. Co., 10130 East Rush St., El Monte, Calif.
Microscopes; borescopes; range finders; optical tooling equipment; lenses; optical test instruments
(See advertisement on page 162)

Testing Equipment Co., 15 William St., New York 5, N. Y.
Instrument-shop tools and instruments

Testing Instruments, Inc., 242 Valley St., Dayton 4, Ohio
Electrical testing instruments for automotive equipment

Testing Machines, Inc., 123 West 64 St., New York 23, N. Y.
Physical testing machines
(See advertisement on page 215)

Testrite Instrument Co., 57 E. 11th St., New York 3, N. Y.
Scientific instruments

Texas Instruments, Inc., 6000 Lemmon Ave., Dallas 9, Texas
Electrical and electronic instrumentation; optical parts and materials

Thayer Scale & Engineering Corp., E. Water St., Rockland, Mass.
Filling and feeding machines; scales

Thermal Syndicate Ltd., 14 Bixley Heath, Lynbrook, N. Y.
Apparatus, laboratory; flats, optical; gas & vapor discharge tubes, mercury; light sources, mercury vapor and ultra-violet; optical parts

Thermador Electrical Mfg. Co., 2000 So. Canfield Ave., Los Angeles 22, Cal.
Laboratory ovens; geophysical transformers
(See advertisement on page 228)

Thermal American Fuzed Quartz, 18-20 Salem St., Dover, N. J.
Optical and insulating parts and materials

Thermco Laboratories, Johnson Rd., Michigan City, Ind.
Industrial instrumentation; gas-analysis equipment

Thermix Corp., Greenwich, Conn.
Aircraft controls; valves, pressure and float switches for aircraft

Thermo-Electric Co., 109 Fifth St., Rochelle Park P. O., Saddle River Twp., N. J.
Thermocouples for aircraft engines & industrial uses, extension lead wires & harnesses

Thermo Electric Manufacturing Co., 465 Huff St., Dubuque, Iowa
Laboratory furnaces

Thermometer Corp. of America, 567 E. Pleasant St., Springfield, Ohio
Industrial Instrumentation; meteorological instruments

Thermosen, Inc., 361 W. Main St., Stamford, Conn.
Vacuum tubes

Thomas Clock Co., Seth, Industrial Sales Dept., Thomaston, Conn.
Household clocks, outdoor & tower clocks, clock movements for industrial purposes, also electric timers

Thomas Co., Arthur, H., West Washington Square, Philadelphia 5, Pa.
Dealers, retail-wholesale-export, in laboratory apparatus & reagents for laboratories of chemistry & biology

Thomas & Skinner Steel Products Co., 1118 E. 23rd St., Indianapolis, Ind.
Permanent magnets

Thompson Balance Co., 802 E. 18 Ave., Denver 5, Colo.
Fine balance & weights

Thompson Clock Co., H. C., 38 Federal St., Bristol, Conn.
Electric stop clocks & interval timers

Thompson Products, Inc., Electronics Div., 2196 Clarkwood, Cleveland 3, Ohio
Microwave instruments; Coaxial switches; polar antenna recorders

Thordarson-Meissner Mfg. Div., Maguire Industries, Inc., 7th & Bellmont, Mt. Carmel, Ill.
Electrical and electronic instrumentation; components

Three Point Industries, 3767 N. Racine Ave., Chicago 13, Ill.
Pipe gages

Thwing-Albert Instrument Co., 5233 Pulaski Ave., Philadelphia 44, Pa.
Pyrometers, paper testing instruments, portable pH meters, general testing instruments & machines

Tigerman Engineering Co., 4332 N. Western Ave., Chicago 18, Ill.
Alarm annunciator systems; switches; signals
(See advertisement on page 76)

Timely Instrument & Controls Co., 1645 W. 135th St., Gardena, Calif.
Temperature controllers; amplifiers

Times Facsimile Corp., 540 West 58 St., New York 19, N. Y.
High speed recording and communications equipment

Timetrol Co., 2919 Gladstone, Rockford, Ill.
Automatic timers

Tinker & Rasor, 203 Del Mar, San Gabriel, Calif.
Pinhole detectors

Tinsley Laboratories, Inc., 2526 Grove St., Berkeley 4, Calif.
Astronomical instruments, optical instruments

Ti-Pi Co., 1000 Broadway, Kansas City 6, Mo.
Thickness gages

Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.
Metal bellows

T.L.G. Electric Corp., 31 W. 27th St., New York 1, N. Y.
Synchroscopes; osilloscopes

Tobe Deutschmann Corp., Norwood, Mass.
Electrical and electronic instruments

Todd Scientific Co., 160 N. State Rd., Springfield, Pa.
Laboratory fractionating equipment; spectroscopes; pressure and vacuum controllers and gages; vacuum pumps

Toledo Scale Co., 1079 Telegraph Rd., Toledo 12, Ohio
Automatic Scale for weighing, counting, check-weighing, compounding, force-measuring, weight-printing & weight-recording; & special devices for testing, classifying & standardizing

Topflight Tape Co., 160 E. 9th Ave., North York, Penna.
Printed pressure-sensitive tape for identification and labeling

Topp Industries, Inc., 5221 W. 102nd St., Los Angeles 45, Calif.
Aircraft and missile test instrumentation; optical instruments and components; automatic control systems
(See advertisement on page 175)

Tork Clock Co., Inc., 1 Grove St., Mt. Vernon, N. Y.
Clocks, timers, time controllers

Torrington Mfg. Co., 557 Field St., Torrington, Conn.
Spring testing machines

Torsion Balance Co., Monhegan Ave., Clifton, N. J.
Weighing machines; balances; scales; weights

Torwico Electronics, Inc., 961 Freylinghuysen Ave., Newark 5, N. J.
Magnetic amplifiers; chokes; transformers

Tracerlab, Inc., 130 High St., Boston 10, Mass.
Radioactivity detectors, continuous thickness gages, nucleonics instrumentation, isotopes

Tracktest Equipment Co., Box 499-A, Franklin 1, Mich.
Speed-time recorders; fifth-wheel speedometers; odometers

Trad Television Corp., 1001 First Ave., Asbury Park, N. J.
Attenuators; oscilloscopes

Trans-Sonic, Inc., Bedford Airport, Bedford, Mass.
Pressure measurement and control systems and components; servo-mechanisms; electrical instruments

Trans-Weigh Co., 114 S. Wayne Ave., Wayne, Pa.
Continuous weighing systems; gravimetric flow-rate meters

Transformer Engineers, 161 E. California St., Pasadena 1, Calif.
Transformers and filters

Transformers, Inc., 532 North St., Endicott, N. Y.
Transformers

Transicoil Corp., 107 Grand St., New York 13, N. Y.
Servo motors

Transistor Products, Inc., 241 Crescent St., Waltham 54, Mass.
Electronic components; photoelectric devices

Transvision, Inc., 460 North Ave., New Rochelle, N. Y.
Soldering irons

Trenton Transformer Corp., P. O. Box 568, Trenton, N. J.
Instrument, regulating and testing transformers, magnetic components

Trerice Co., H. O., 1420 Lafayette Blvd., W., Detroit 16, Mich.
Industrial instruments

Triad Transformer Mfg. Co., 4055 Redwood Ave., Venice, Calif.
Relays

Tri-Dex Electronics, P. O. Box 1207, Lindsay, Calif.
Amplifiers; etched circuitry, moisture testers

Trimount Instrument Company, 3119-21 West Lake St., Chicago 12, Ill.
Manometers: well type, sliding scale U-tube, fixed scale U-tube, inclined, absolute pressure, & service; gages: draft & mercury pressure; indicating flow meters & tank level indicators

Triner Scale & Mfg. Co., 2714 W. 21st St., Chicago 8, Ill.
Scales and service

Trinity Equipment Corp., 472 Westfield Ave., East, Roselle Park, N. J.
Thermocouple wells; thermometer test wells; separable sockets for thermometers; drilled, welded and cast protecting tubes; stainless steel laboratory apparatus; special alloy machine products; deep hole drilling of alloy bars; API-ASME code alloy welding and fabrication

Trio Laboratories, 3293 Seaford Ave., Wantagh, N. Y.
Electrical and electronic instrumentation

Triplett Electrical Instrument Co., Harmon Avenue, Bluffton, Ohio
Electrical measuring instruments & radio testing equipment. Also instruments for laboratory and industrial test purposes; switches, relays, resistors, shunts

Triumph Mfg. Co., 913 W. Van Buren St., Chicago 7, Ill.
Radio test instruments

Troemner, Henry, 911 Arch St., Philadelphia 7, Pa.
Balances

Tung-Sol Electric Inc., 95 8th Ave., Newark 4, N. J.
TV and special-purpose electron tubes; semiconductor products; signal lamps

Turner Electric Co., E. W., Box 6564, Philadelphia 38, Pa.
Thermowells

U

U C Indicator Co., 624 E. Locust St., Milwaukee 12, Wis.
Liquid level gages

Uehling Instrument Co., 470 Getty Ave., Paterson 8, N. J.
Co_2 recorders, vacuum recorders, absolute pressure recorders, draft recorders, combined pressure & vacuum recorders, liquid level gages, pressure & vacuum gages, inclined draft gages, well-type direct reading manometers, U-tube manometers, absolute pressure gages
(See advertisement on page 276)

Uhrig Co., Joseph F., 4101-03 North 5 St., Philadelphia 40, Pa.
Scientific glassware

Ulanet Co., George, 413-15 Market St., Newark 5, N. J.
Thermostats
(See advertisement on page 223)

Ultradyne Engineering Labs., Inc., P. O. Box 8007, Albuquerque, N. Mex.
Industrial and aircraft pressure instrumentation

Ultrasonic Corp., 640 Memorial Dr., Cambridge 42, Mass.
Computers, accessories, components; data processing and remote control equipment; microwave and ultrasonic equipment; electronic instrumentation

Ultrasonic Engineering Co., 1613 S. 3 Ave., Maywood, Ill.
Ultrasonic generators, viscometers, and transducers; photoelectric photometers

Ultra-Violet Products, Inc., 145 Pasadena Ave., South Pasadena, Calif.
Fluorescence and ultra-violet lamps; blacklight
(See advertisement on page 85)

Unertl Optical Co., John, 3551-3555 East St., Pittsburgh 14, Pa.
Optical instruments

Ungar Electric Tool Co., Inc., 4101 Redwood Ave., Venice, Calif.
Electric soldering irons

Uniflow Valve Corp., P. O. Box 171, Linden, N. J.
Automatic control valves; valve positioners

Uniform Tubes, Level Road, Collegeville 2, Pa.
Precision tubes of all metals
(See advertisement on page 138)

Unimax Switch Div., W. L. Maxson Corp., 460 W. 34th St., New York 1, N. Y.
Switches

Union Switch & Signal Div., Swissvale 18, Pa.
Industrial and aircraft instrumentation; relays and switchgear

Unistrut Products Co., 1013 W. Washington Blvd., Chicago 7, Ill.
Racks; fluorescent-fixture supports

United Carbon Products Co., Inc., 1300 N. Madison St., Bay City, Mich.
Laboratory apparatus & supplies

United Control Corp., 4540 Union Bay Place, Seattle 5, Wash.
Temperature, level and position instrumentation

United Electric Co., Engrg. Div., 3938 W. Roosevelt Rd., Chicago 24, Ill.
Electrical indicating instruments

United Electric Controls Co., 85 School St., Watertown 72, Mass.
Switches

United Electronics Co., 42 Spring St., Newark 2, N. J.
Vacuum capacitors and vacuum tubes

United Engineers, Inc., 820 E. Sixth St., Tulsa, Okla.
Industrial measurement and control equipment; radioactivity instrumentation

United Instrument Co., 574 President St., Brooklyn 15, N. Y.
Pressure and temperature instrumentation
(Seeadvertisement on page 222)

United Mfg. Co., Div., W. L. Maxson Corp., 41 Haig St., Hamden 14, Conn.

United Optical Mfg. Corp., 202-4 E. 19th St., New York 3, N. Y.
Electrical measuring instruments

United Scientific Co., 204 Milk St., Boston 9, Mass.
Microscopes; camera microscopes; astronomical telescopes; meteorological instruments

United States Blue Print Paper Co., 207 S. Wabash Ave., Chicago 4, Ill.
Surveying instruments

U. S. Components, Inc., 454 E. 148th St., New York 55, N. Y.
Connectors

U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif.
Speed control equipment; motors; generators

United States Electronics, 275 Warren St., Lyndhurst, N. J.
Electrical filters, chokes and transformers; solenoids

U. S. Engineering Co., 521 Commercial St., Glendale 3, Calif.
Electronic hardware
(See advertisement on page 133)

U. S. Expansion Bolt Co., Standard Div., York, Pa.
Dimensional gages

United States Fare Taximeter Co., Div. of Weisinger Recording Instruments Corp., 503 W. 54th St., New York 19, N. Y.
Speedometers, tachometers, taxi meters

United States Gauge Div., American Machine & Metals, Sellersville, Pa.
Indicating & recording pressure gages
(See advertisement on page 123)

United States Instrument Corp., P. O. Box 33, Charlottesville, Va.
Voice powered telephone equipment

United States Radium Corp., 535 Pearl St., New York 7, N. Y.

U. S. Relay Co., 1744 Albion St., Los Angeles, Calif.
Relays and switchgear

U. S. Stoneware Co., 60 E. 42nd St., New York, N. Y.
Laboratory supplies; air and hydraulic tubing; anti-corrosion coatings

U. S. Testing Co., 1415 Park Ave., Hoboken, N. J.
Testing machines and instruments; accessory equipment

United States Time Corp., 500 Fifth Ave., New York 36, N. Y.
Gyroscopes

United Transformer Corp., 150 Varick St., New York 13, N. Y.
Transformers

Unitek Corp., 275 N. Halstead St., Pasadena 8, Calif.
Automatic welding machines.
(See advertisement on page 239)

Unitronics, Inc., P. O. Box 191, Ferguson 21, Mo.
Light integrators; photoelectric controls

Universal Atomics Corp., 19 E. 48th St., New York 17, N. Y.
Radioactivity instrumentation; power supplies
(See advertisement on page 172)

Universal Aviation Equipment, Inc., 362 Fifth Ave., New York 1, N. Y.
Testing machines and instruments

Universal Drafting Machine Co., 7960 Lorain Ave., Cleveland 2, Ohio

Universal Electronics Co., 2012 So. Sepulveda Blvd., Los Angeles 25, Calif.
Regulated power supplies
(See advertisement on page 176)

Universal Engraving & Color Plate Co., See Engineer's Specialty Div.

Universal General Corp., 324 Canal St., New York, N. Y.
Supply house for relays, switches, and other electrical-electronic components.
(See advertisement on page 190)

Universal Scientific Co., Inc., 1102 Shelby St., Vincennes, Ind.
Transformers; electrical teaching aids

Universal X-Ray Products, Inc., 1140 Western Ave., Chicago 22, Ill.
Barometers, manometers, vacuum gages, X-ray equipment

Univis Lens Company, 401 Leo St., Dayton 1, Ohio
Optical flats, lenses & prisms

V

Vaco Products Co., 317 E. Ontario St., Chicago, Ill.
Instrument-shop tools; solderless terminals

Vacutron, Inc., 2819 12th St., So., Arlington, Va.
Special vacuum tubes; electronic circuits & industrial control devices

Vacuum Electronics Engg. Co., 86 Denton Ave., New Hyde Park, L. I., N. Y.
Leak detectors

Vacuum Tube Products, 506 S. Cleveland St., Oceanside, Calif.
Vacuum gage tubes and controls; c-r indicator and thyratron tubes; vacuum pumps

Vacuum Research Co., 2050 Orchard Ave., San Leandro, Calif.
Automatic-control valves; gaskets and seals
(See advertisement on page 229)

Valco, Inc., 1410 West St., Cincinnati 15, Ohio
Automatic valves

Valpey Crystal Corp., 1244 Highland St., Holliston, Mass.
Standard-frequency crystals; crystal-oscillator ovens

Valv-Trol Co., 573 Baird St., Akron 11, Ohio
Pressure controllers; control valves; accessories

Valvair Corp., 454 Morgan Ave., Akron 11, Ohio
Control valves

Valve Pilot Corp., 230 Park Ave., New York 17, N. Y.
Locomotive speed & cut-off indicator & recorder

Valverde Labs., 252 Lafayette St., New York 12, N. Y.
Thermal controls

Van Keuren Co., 176 Waltham St., Watertown, Mass.
Optical comparators & flats

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Van Wagner Co., 89-04 113 St., Richmond Hill 18, N. Y.
Inspection devices

Vanton Pump & Equipment Corp., 201 Sweetland Ave., Hillside 5, N. J.
Metering and proportioning pumps

Vapor Recovery Systems Co., 2820 N. Alameda St., Compton, Calif.
Liquid level gages, manometers, remote metering equipment and control valves

Varian Associates, 611 Hansen Way, Palo Alto, Calif.
Klystrons; nuclear resonance spectrometers; traveling-wave tubes; amplifiers; fluxmeters; electronic components

Vari-L Co., 432 Fairfield Ave., P. O. Box 1433, Stamford, Conn.
Variable Inductors
(See advertisement on page 136)

Varo Mfg. Co., Box 638, Garland, Texas
Electronic instruments

V & E Manufacturing Co., P. O. Box 950M, Pasadena 20, Calif.
Drafting machines; drafting room instruments

Vectron Inc., 1575 Trapelo Rd., Waltham 54, Mass.
Optical and electronic instruments, automatic control systems; aircraft instruments
N. Y.

Veeder-Root, Inc., 28 Sargent St., Hartford 2, Conn.
Electrically operated counting devices, a.c. and d.c.
(See advertisement on page 20)

Versa Products Co., Inc., 249 Scholes St., Brooklyn,
Motorized valves

Vibra Shock Corp., 5232 River Rd., Washington 16, D. C.
Vibration and acceleration instrumentation
(See advertisement on page 235)

Vibration Measurement Eng., 7665 Sheridan Rd., Chicago 26, Ill.
Seismographs

Vibro-Ceramics Corp., 212 Durham Ave., Metuchen, N. J.

Vickers Electric Div., Vickers Inc., 1815 Locust St., St. Louis 3, Mo.
Rectifiers and photoelectric cells

Vickers, Inc., 1400 Oakman Blvd., Detroit 32, Mich.
Pumps & valving devices for control of power in oil-hydraulic systems

Victor Laboratory, J. N., 701 Lechauweki Ave., Bethlehem, Pa.
Testing instrumentation; oscillographs; scientific cameras

Victoreen Instrument Co., 5806 Hough Ave., Cleveland 3, Ohio
Electrometers, spectrometers, vacuum tubes
(See advertisement on page 186)

Victory Engineering Corp., P. O. Box 573, Springfield Rd. & Iorio Ct., Union, N. J.
Analyzing, detecting and automatic control instruments

Viking Copper Tube Co., 16700 St. Clair, Cleveland, Ohio
Air & hydraulic tubing

Viking Electric, 21343 Roscoe Blvd., Canoga Park, Calif.
Connectors and jacks; thermocouples and tubes; transformers

Viking Instruments Inc., East Haddam, Conn.
Tachometers, switches, remote control equipment
(See advertisement on pages 75, 80, 100, 142)

Vinco Corp., 9111 Schaefer Highway, Detroit 28, Mich.
Special gages

Virginia Electronics Co., River Road & B & O R.R., Washington 16, D. C.
Electrical and electronic instrumentation; soldering machines

Visco-Meter Corp., 315 Grote St., Buffalo 7, N. Y.
Viscosimeter

Vitramon, Inc., Box 544, Bridgeport, Conn.
Precision capacitors

Volcaline Co. of Am., Inc., Bristol Motor Div., 111 Coulter St., Old Saybrook, Conn.
Carrier communication systems; automatic-control systems; time and program controllers; relays and switches

Voland & Sons, Inc., 32 Relyea Pl., P. O. Box 680, New Rochelle, N. Y.
Analytical balances & weights
Communication measuring instruments

Volkers & Schaffer Mfg. Corp., Box 996, Schenectady, N. Y.
Oscillographs and oscilloscopes; components

Vought Co., P.O. Box 1350, Beverly Hills, Calif.
Recording cameras; high-speed m-p cameras

W

Wabash Metal Products Co., Hydraulics Div., 1569 Morris St., Wabash, Ind.
Laboratory presses
(See advertisement on page 178)

Wagner & Son, Carl H., 1944 N. Albany Ave., Chicago 47, Ill.
Thermometers

Wakefield Industries, Inc., 5108 W. Grove St., Skokie, Ill.
Fractioning columns; pipettes, etc.

Waldom Electronics, Inc., 4625 W. 53rd St., Chicago 32, Ill.
Instrument and electronic hardware

Walker & Co., Geo. T. 324 Fifth Ave., South, Minneapolis 15, Minn.
Laboratory supplies

Walker-Jamieson, Inc., 311 S. Western Ave., Chicago 12, Ill.
Radio & electronic supplies

Walkirt Co., 145 W. Hazel St., Inglewood 3, Calif.
Counters; monitors; testers; scalers
(See advetisement on page 172)

Wall Colmonoy Corp., 19345 John R. St., Detroit 3, Mich.
Brazing and welding materials; thermometer wells

Wallace & Tiernan Company, 25 Main St., Belleville 9, N. J.
Chlorine control & chemical feed devices, meteorological instruments
(See advertisement on pages 143, 179, 183, 273)

Walser Automatic Timer Corp., 420 Lexington Ave., New York 17, N. Y.
Timers

Waltham Watch Co., Waltham 54, Mass.
Stop watches

Wang Laboratories, 37 Hurley St., Cambridge 41, Mass.
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Warren-Knight Co., 136 N. 12th St., Philadelphia 7, Pa.
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Warrick Co., Charles F., 1964 West 11 Mile Rd., Berkley, Mich.
Relays & auxiliary equipment for level controls
(See advertisement on page 103)

Warrick, Frederick P., Rt. No. 1, W. Long Lake Rd., Bloomfield Hts., Mich.
Scientific cameras

Water Leak Detector Co., 114 N. Third St., Columbus 15, Ohio
Water leak detectors

Water Level Controls Div., Healy-Ruff Co., 2255 University Ave., St. Paul 14, Minn.
Liquid level controls

Waterman Engineering Co., 721 Custer Ave., Evanston, Ill.
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Waterman Products Co., Inc., 2445 Emerald St., Philadelphia 25, Pa.
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(See advertisement on pages 14-15)

Waters Mfg. Inc., 4 Gordon St., Waltham 54, Mass.
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(See advertisement on page 120)

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(See advertisement on pages 172, 179, 199)

Weiller, Paul G., 95 Broad St., New York 4, N. Y.
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Weinschel Engineering Co., Inc., 10503 Metropolitan Ave., Kensington, Md.
Electrical and electronic components
(See advertisement on page 151)

Weiss & Son, Albert A., 261-263 Vanderbilt Ave., Brooklyn 5, N. Y.
Special thermometers

Weksler Thermometer Corp., 195 E. Merrick Rd., Freeport, L. I., N. Y.
Thermometers, hydrometers, psychrometers
(See advetrisement on page 222)

Welch Allyn, Inc., Skaneateles, N. Y.
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West Coast Electronics Co., 5873 W. Jefferson Blvd., Los Angeles 16, Calif.

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Western Gear Works, Electro Products Div., Box 182, Lynwood, Calif.
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(See advertisement on page 153)

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(See advertisement on page 107)

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(See advertisement on page 117)

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Whittington Pump & Engineering Corp., 1126 Prospect St., Indianapolis 3, Ind.
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(See advertisement on page 182)

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(See advertisement on page 99)

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(See advertisement on page 149)

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(See advertisement on page 160)

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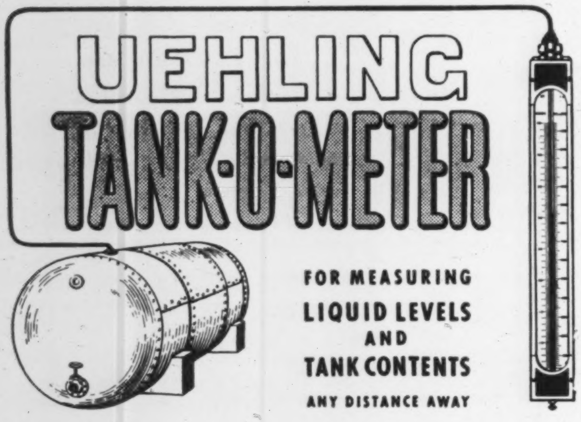

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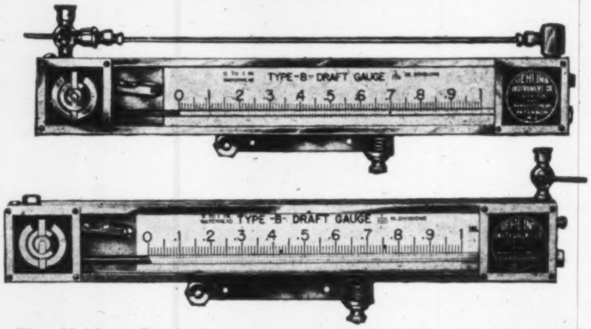

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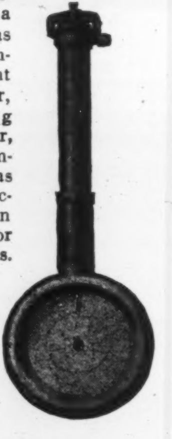

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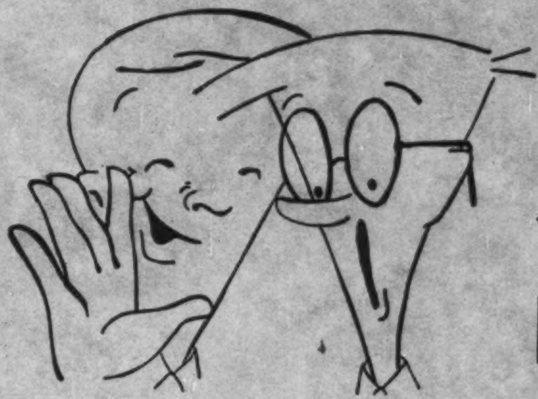

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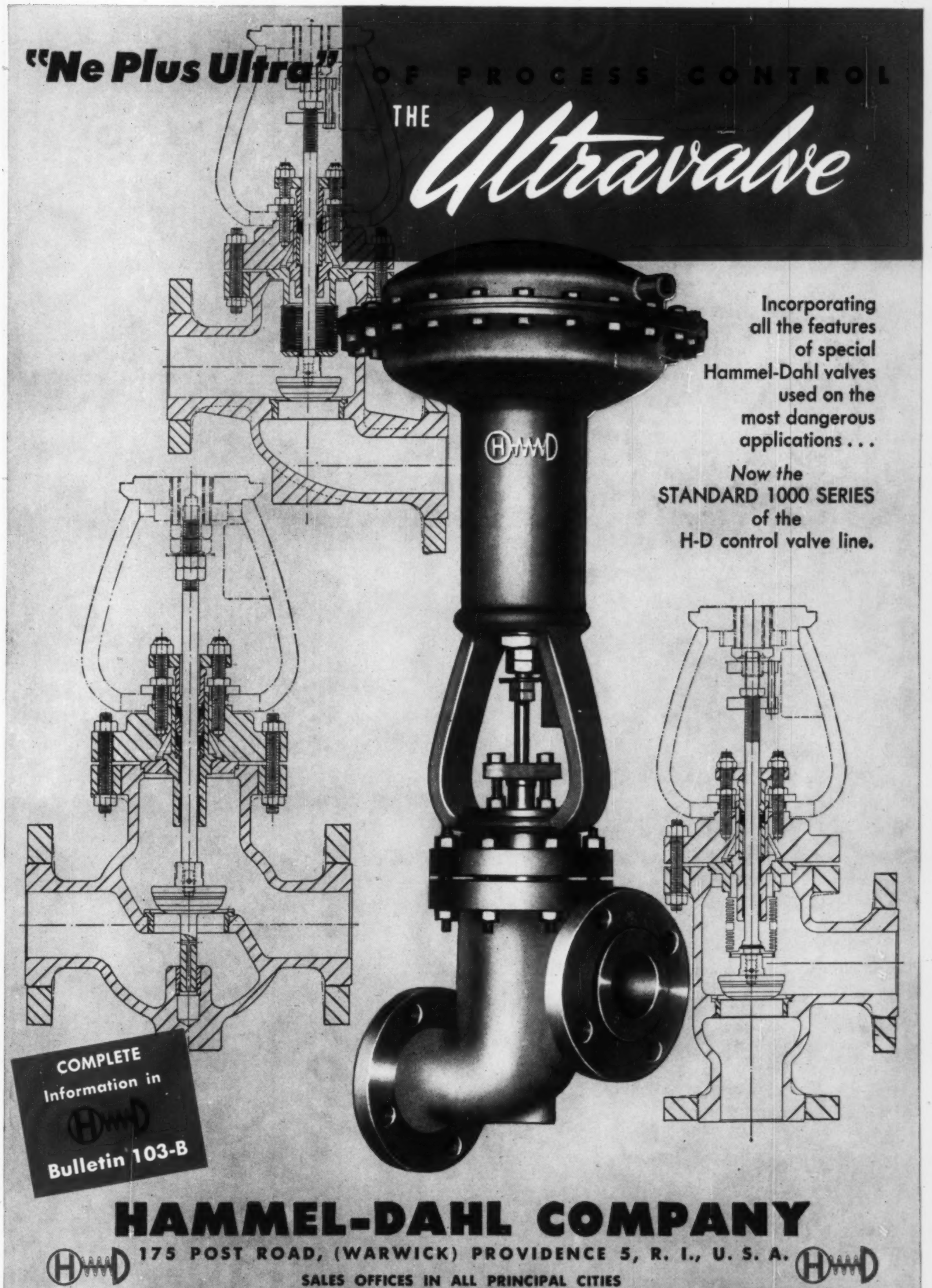

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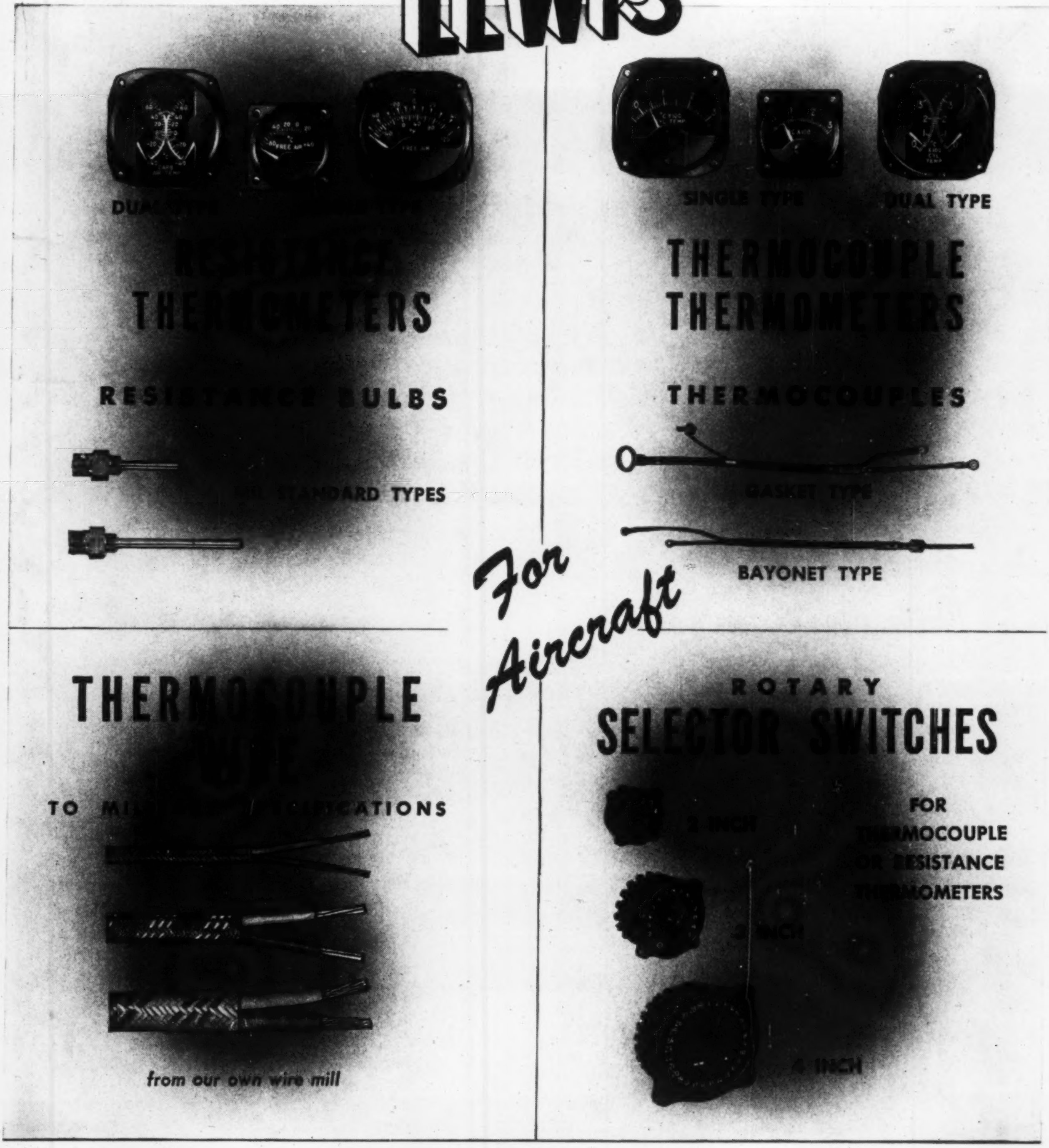
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